POST-WAR FOREST POLICY
FOR
INDIA

A NOTE
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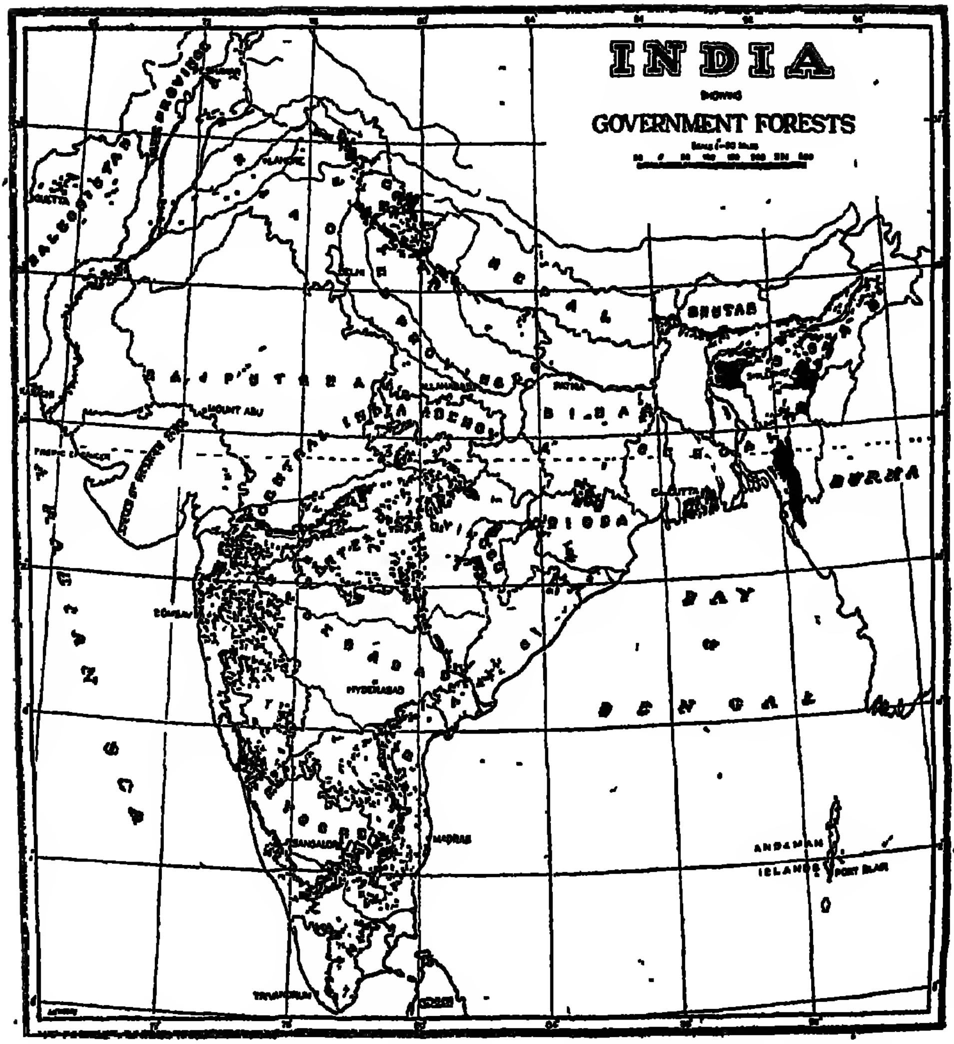
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Summary

Part I.—Review of Present Conditions

INTRODUCTION

Paras. 1 and 2.—The accuracy of the figures given cannot be guaranteed, but they are sufficiently accurate correctly to illustrate the problems. The note is written for British India but much of it also applies to Indian States.

Chapter I

THE GOVERNMENT IN RELATION TO FORESTRY

Paras. 3 and 4.—Governments must necessarily limit individual freedom in order to govern. The principle of the greatest good to the greatest number is laid down as a principle of the existing forest policy of India. The long rotations necessary in forestry make forests an unsuitable investment for the individual. This has been the experience in India, Europe and America. In all three private forests have tended to disappear.

Para. 5.—Ideally, Government should take over all forests which must be preserved for climatic or physical reasons and such further quantity as may be necessary to supply the general needs of the community. But this procedure would often interfere more with individual rights than any Government would wish.

Paras 6 and 7.—The above principles should be applied to India, the Forest Act being amended accordingly and a measure of control introduced over private forests. It should not be forgotten that the important needs of the agricultural villager must be supplied from forests near at hand, as the value of the produce cannot support long transport.

Para. 8.—The main problem in India is to supply the ordinary agricultural villagers with the forest produce they need largely to prevent the burning of cowdung, the most easily obtainable manure.

Para. 9.—Possibly too little land is directly available and properly distributed for this purpose and it may mean acquisition and compulsory management by the Forest Department.

Para. 10.—Various methods of control of private ownership of forests have been found necessary in Europe and are:

(i) Prevention of mere destruction only. This is the minimum of control.
(ii) Prevention of trade in woodlands.
(iii) Compulsory regeneration of felled areas usually within a specified number of years.
(iv) Compulsory management on the method of sustained yield.
(v) Restriction on the rotation of felled trees.
(vi) Control of actual silvicultural operations. This begins to approach proper forest management.

(vii) Compulsory proper forest management This may involve great restrictions on the private owner but is the best for the general well-being of the country and is the minimum that should be enforced in any area falling under class (a) protection forests (see Chapter II).

(viii) The ultimate stage of control of taking over the management and managing it on the owner's behalf.

Chapter II

EXISTING FOREST POLICY

Para. 11.—The existing forest policy of India evolved in 1894, nearly 50 years ago, only reduced to writing the aims of the Indian Forest Department since its foundation in 1865, nearly 80 years ago. The principles laid down are excellent and a detailed study of the policy is necessary for anyone dealing with forest matters. Its contents are summarized paragraph by paragraph in paragraph 11 of this note. It classifies Government forests into:

(a) Those necessary on climatic and physical grounds (prevention of floods, erosion or desiccation, i.e., Protection forests).

(b) Timber forests (principally for timber supply and revenue)
(c) Minor forests (principally to supply local needs).
(d) Pasture forests.

This classification gives the function of the forests and has nothing to do with the legal classification of forest under the Forest Act as Reserved, Protected, etc. The classification indicates a policy of management for each class A given forest may easily fall under more than one class and in fact many forests falling under classes (b), (c) and (d) ought also to be classified as falling under class (a) which is often their most important function.

Para. 12.—The outstanding principles of the above policy are:

(a) that first and foremost the preservation of the climatic and physical conditions of the country comes before everything else;

(b) that the preservation of the minimum amount of forest necessary for the general well-being of the country is second only to (a) above.

But provided the above two conditions are fulfilled, then:

(c) cultivation comes before forestry,

(d) the satisfaction of the wants of the local population free or at non-competitive rates comes before revenue; and

(c) after all the above are satisfied the realization of revenue to the greatest possible extent is permitted.

Comments on the existing forest policy

Paras. 13 and 14.—The general principles are excellent, but as stated before, the classes of the policy are not exclusive and have nothing to do with the legal classification under the Forest Act.

Para. 15.—The above policy does not specifically mention the principle of sustained yield but with the concurrence of the Government of India the Forest Department since its inception has managed its forests under this principle Sustained yield ensures that forest produce does not decrease from year to year, that the yearly yield is equal or gradually rises till the maximum yield is obtained. The reasons for adopting the principle of sustained yield are, among others :

(a) a stable industry cannot exist with excessive fluctuations;

(b) so many are dependent on forests for their livelihood that large fluctuations would upset social conditions;

(c) Government budgets necessitate approximately equal revenue

Paras. 16 to 20.—The above policy nowhere lays down the percentage of the country which should be under forest. *Para. 16* analyses the area of Government forests in India. They occupy only 14 per cent of the total area and that classed as merchantable only 9·3 per cent *Para. 18* gives a classification by ownership in the various provinces, and it will be seen that 20 per cent of British India is covered with forest of a sort but only 12 per cent is occupied by what is classed as merchantable As the private forests are fast disappearing, only 122,000 square miles of State forests or 14 per cent of the total area can be considered as the real area of forest land in India and even of this there are 24,000 square miles not under the control of the Forest Department, much of which is also disappearing. As already stated only 9·3 per cent of the total area of British India is classed as merchantable

Paras. 21 and 22.—Taking an average of European countries, it appears that about 25 per cent of the area is the normal ordinary area of forest.

Para. 23.—As a rough minimum guide for India, 20 to 25 per cent might be adopted, and this must be properly distributed over provinces.

Paras. 24 and 25.—Many individual provinces have less forest land than would ordinarily be considered necessary. Roughly speaking, south of a line from Cambay to Calcutta, the distribution of forests is fairly adequate; but north of that line the forests under the Forest Department consist of a narrow strip in the north, the forests in the east of Assam, the Sundcrbans and a few odd patches down the Indus, the south of the United Provinces and in Bihar and Orissa. The distribution is clearly shown on Map I, but that unfortunately omits the forests of Indian States. On Map II, an attempt has been made to insert those forests of Indian States which are under proper forest management.

Para. 26.—The existing forest policy does not include any indication that it aims at increasing the forest area up to the minimum requirements of the country. It would be an advantage to aim at increasing to a minimum. more especially for forests falling under class (a) Protection forests.

Paras. 27 and 28.—There are three methods of increasing the forest area :

(a) bringing more Government waste lands under forest;
(b) bringing more private area under forest; and
(c) legal control of private forests.

The Forest Act legislates for the control of private forests in Chapter V, but in practice this has been largely ineffective Certain provinces in India have already taken steps to draft legislation to control the destruction of private forests even though these draft bills have not yet become law Attention may be called to the following :

(i) The Chota Nagpur Private Forests Bill of 1939.
(ii) The United Provinces Rural Development Bill of 1939.
(iii) The Report of the West Bengal Forest Committee containing the Bengal Private Forests Bill of 1939.

It is understood that the North-West Frontier Province is also contemplating the revision of the rules for Guzara forests under the Hazara Forest Regulation.

Chapter III

EXISTING DEMANDS ON AND SUPPLIES OF FOREST RESOURCES

Para. 29.—Forest produce consists of major forest produce, timber and fuel, and minor forest produce, which includes everything else like resin, drugs, grazing, etc In this chapter minor forest produce is excluded, except grazing.

Para. 30.—It is convenient to divide the consumers of forest produce into

(a) General consumers whose wants are supplied by the timber trader. They are mostly urban population.

(b) Local village consumers, that is villagers living near forests.

(c) Ordinary village consumers who live far distant from any source of supply of forest produce.

Para. 31.—The general consumers, in addition to a demand for fuel, need large timber valuable enough to bear the cost of transport. The village consumers, on the other hand, are mostly agriculturists, and they need small timber and fuel, neither of which are sufficiently valuable to bear the cost of transport.

Para. 32.—War fellings have temporarily upset the orderly plans of forest management.

Paras 33 and 34.—Before the war the position in the reserved forests of India was favourable. Working plans legislated for periodic stock-taking and, although the forests of India were not yet fully productive, they had progressed as nearly as could be expected in the course of 80 years. The Forest Department 80 years ago took over a depleted and often ruined forest estate, and full production cannot be attained in less than a full rotation.

Para. 35.—All the more valuable forests of India before the war were covered by adequate and up-to-date working plans. There were some arrears in Bombay and Bengal, while in Assam the plans were sometimes based on rather insufficient data and in Bihar plans were sometimes lacking for those private forests recently taken under control. But the former favourable position has been partly upset by war fellings.

Paras. 36 and 37.—A table in *para. 36* attempts to compare the fellings during the war with pre-war fellings. It appears that for timber an excess of about 162 per cent has been felled or in other words about 1½ years advance felling on the average.

Para 38.—The United Provinces, the Punjab, the Central Provinces, Bombay and Sind have largely increased fellings in 1942-43 and by the end of 1943-44 might easily be four to five years in advance. It is difficult to give a general picture but by the end of 1943-44 the United Provinces will have felled about nine years yield during the five years of war. Unfortunately this has often been felled on the best trees in the most accessible areas. It is difficult to make any accurate calculation but it would appear that a 40 or 50 per cent reduction over the pre-war yield for a period of between five and ten years would bring the position approximately back to normal. That is about the worst to be faced. If 20 years were taken, the reduction would be much less. In Madras the fellings of teak are probably five years in advance and in Bombay in some teak areas as much as ten years in advance.

Para. 39.—This excess, however, has come partly from valueless species having become valuable and from thinnings which silviculturally were necessary and which could not otherwise have been made.

Para. 40.—These over-fellings have not hurt the climatic and physical function of the reserved forests and are of no real importance in comparison with the total rotations of the forests of India.

Para. 41.—But the over-felling has, of course, upset the working plans position and rapid revision of most working plans will be immediately necessary after the war.

(a) *The general consumer*

In normal times the outturn of timber and fuel from forests under the control of the Forest Department is a little under 6 million tons. There are no records of the outturn from private forests, but it may be guessed as perhaps 50 per cent. of the above.

Paras. 42 & 43.—Para. 42 gives a table of imports and it will be seen that the normal imports are only about 185,000 tons of timber, or say 3 per cent of the total timber from the Forest Department areas or not more than 2 per cent, if private forests are included. Even of this 2 per cent a large quantity was teak from Burma which will ultimately be replaced by teak grown in India. There is some import from province to province. Generally speaking, it can be said that under pre-war conditions, except for teak, Indian forests generally supplied the wants of the general consumer. It is true that the forests outside the control of the Forest Department are deteriorating and the demands of the general consumer are rising, but, even so, taking a long-term view, there is no serious problem for the supply of timber for the general consumer.

(b) *The local village consumer*

Para. 44.—Here again, with the exception of Sind and Assam, it appears that as a whole the wants for forest produce of these local village consumers are adequately supplied and there is no serious problem.

(c) *The general village consumer*

Para. 45.—In the Central Provinces and to a certain extent in Madras, the distribution of the forests is such that there is no great problem even for the general village consumer.

Para. 46.—In the rest of British India, the demands of the general village consumer are not supplied or most insufficiently supplied. This is true over large parts of the Punjab and the North-West Frontier Province, for probably 90 per cent of the plains villages of the United Provinces, for probably half of Bombay, for all the centre and west of Bengal, and for much of Bihar and the coast lands of Orissa. Even if it were possible to transport the forest-produce demanded by these populations from the existing forests, the forests would be unable to supply.

Para. 47.—The crux of the whole problem is to supply this population with small house-building timber, agricultural timber and fuel so as to raise its general standard of life and save the cowdung for manure.

Paras. 48 and 49.—It has not been possible to get any figures for the cowdung burnt in India. At a guess assuming that there are 300 million cattle in India and that the cowdung is burnt only from 150 million, then, if the dry weight of cowdung produced per head per day is 10 lbs., it gives 250 million tons of cowdung per year. These figures do not exactly agree with figures from the Imperial Council of Agricultural Research. Their estimate is about 560 million tons of cowdung is burnt per annum. The important point, however, is that whichever figure is correct, it makes the saving of this cowdung for manure a vital problem in the agricultural economy of India.

Para. 50.—Agricultural evidence shows that about 3½ tons of manure per acre roughly doubles the crop, so that the 250 million tons of cowdung could manure 72 million acres out of the 226 million acres of cultivated land in India, that is to say about 30 per cent. of the whole of India's cultivation.

Para. 51.—Loss of production is not the only evil in burning cowdung. The fields deprived of manure decrease in fertility, the produce gets less and less, the soil is more liable to erosion and a vicious circle of general poverty is created.

Para. 52.—To supply these wants is the main problem and it more especially concerns the northern two thirds of India. The general prosperity of India depends largely on the prosperity of the peasants and this in turn is very largely dependent on having fuel and small timber available in the immediate neighbourhood.

Para. 53.—The question of grazing is mixed up with this. But these minor forests, managed to supply the wants of the agriculturist, will all be short-rotation forests, so that for a large portion of each rotation they would provide good grazing and for the rest of the rotation would provide general exercise grounds for the cattle.

Chapter IV

FLOODS, EROSION AND DESICCATION

Para. 54.—The importance of the problem may be illustrated by the following accounts in *The Statesman* on two consecutive days, August 20 and 21, 1943.

(a) Jumna floods affecting 30 villages, hundreds of people and thousands of cattle.

(b) Ajmer-Merwara floods with 1,500 people drowned.

(c) Damodar river floods on 45 square miles, affecting 27,000 people with a request for Rs. 90,000 for relief and Rs. 100,000 for agricultural loans.

(d) Orissa floods affecting 400 square miles

Para. 55.—Erosion rubs away the surface soil, forms finger gullies, and soluble chemicals and micro-organisms are lost. This is sheet erosion and though most important, is not obvious to the casual observer.

Para. 56.—Eventually, the gullies extend right through the top soil to the sub soil, produce excessive drainage and lower the level of underground water. Such erosion is obvious to everybody.

Para. 57.—Floods and erosion are intimately connected with class (a) Protection forests and classes (c) and (d) Minor Forests and Pastures.

Para. 58.—Correct land management has far and away the most important influence in preventing floods and erosion. The management of fields is important, but it does not concern the Forest Department. But much of the land is not agricultural land and should be placed in class (a) Protection forests, and properly managed by the Forest Department. High forest cover is one of the best forms of land management to prevent erosion in hilly country.

Paras. 59 & 60.—There are large areas along the Himalayas and in other parts of India bare of tree growth, open to unlimited grazing and often burnt yearly. The erosion problem is often intimately connected with (c) and (d) class forests, namely Minor forests and Pastures which should also often be put under class (a) Protection forests

Para. 61.—Forests under the Forest Department usually control adequately the erosion and flood problems within their actual boundaries. In the Minor forests of the Central Provinces, in the United Provinces in certain areas with excessive grazing rights, and in Madras in the mismanaged panchayat forests, the run-off and erosion problem is not sufficiently controlled even within the forest boundaries. Some of the reserves in Bombay are so scattered and broken that it is not properly controlled there. On the whole, however, within the forest boundaries the problem is controlled.

Para 62.—But the trouble is that the forest areas under the Forest Department are usually so badly distributed throughout the province that the general flood and erosion problem is not controlled. Except in the Central Provinces where the problems are only local, there are serious flood and erosion problems in the Punjab, the North-West Frontier Province, the United Provinces, in Orissa, Bihar, Bengal (particularly in Western Bengal), Assam (especially in the hills), and even Madras despite the rather large proportion of the total area under the Forest Department.

Paras. 63 to 65.—The percentage of the precipitation that is lost is in the following proportion :

Forest with normal ground cover	1
Forest burnt annually and litter removed (or grazed heavily)	3
Well-managed pasture	3
Grass land	10
Completely bare ground	25

The loss of soil per acre per year under the different soil covers is :

Forest with normal ground covering	1
Forest burnt annually and litter removed (or heavily grazed)	20
Well-managed pasture	14
Grass land	130
Completely bare ground	3,250

Para. 66.—In the above two tables it is interesting to note that although forest with its normal ground cover is better than any other form of land management to prevent run-off and erosion and although forest soil burnt annually with the litter removed or heavily grazed is still quite good at preventing run-off and is as good as well-managed pasture; the removal of the litter has minimised its capacity for preventing erosion. If the forest litter is completely removed the figure for erosion rises to about 190 so that the complete removal of litter under forest cover turns the best preventive of erosion into a poor preventive.

Para. 67.—Agricultural crops appear to have a greater run off and erosion than bare land.

Para. 68.—It is single heavy storms rather than the average rainfall which does the damage. The following figures give the general proportions of run-off and soil loss in single heavy storms for three different kinds of soil cover.

Cover	Run-off	Soil loss
Forest	1	1
Grass	27	32
Bare land	125	800

Para. 69.—West of a line running roughly from Ambala *via* Etawah to Ratlam and across to Mt. Abu, the rainfall is below 30 in. and only tropical dry thorn forest will grow West of a line from Lahore to Rohtak and then through Ajmer to Nawanagar, the rainfall is below 20 in. and the forest is even more scrubby and scanty, though down to that rainfall forest of a sort can still be grown perfectly well without irrigation and the species are useful for the small timber and fuel so necessary for the agriculturist. Such species as *babul (kikar)* if there is no frost, *shisham*, *khair* could all be grown. West of a line roughly from Lyallpur through Bikaner, about 50 miles west of Jodhpur and then down to a point about 100 miles south-east of Karachi, the rainfall sinks below 10 in and from that line westward the rainfall gets less and less till complete desert conditions are met Even here, however, over much of the area, forest of a sort could be grown if water could be provided for the first two or three years. Needless to say, with proper irrigation forests could be easily grown over much of this area provided suitable species were chosen.

Para. 70.—It has been stated that this dry belt is advancing eastwards into the Gangetic plain. Its afforestation, therefore, would not only be a great adjunct to agricultural dry farming but would increase the general fertility and improve the climate of the tract itself in addition to acting as a barrier against the spread of desert conditions into the Gangetic plain to the east of the 30 in. rainfall line.

Chapter V
FOREST RESEARCH

Para. 71.—Forest research is centralized in Dehra Dun, though there are certain provincial research officers

Para. 72.—At the Forest Research Institute the administrative head is the President who is a forest officer. There are branches of Botany, Silviculture, Entomology, Chemistry and Minor Forest Products and Utilization, each with a branch officer. There is a Timber Development branch virtually in abeyance. The President has a personal assistant

Paras. 73 to 75.—*Paras. 73 and 74* deal with the work of the branches other than Utilization and their staff. *Para. 75* deals with the staff of the Utilization branch.

Para. 76.—The general account omits certain variations caused by the war

Para. 77.—The Inspector General of Forests is also the President Although there had been a great increase in the President's work between 1920 and 1925, it was decided to combine the posts of the President and the Inspector General of Forests in 1926 on the ground that the Inspector General's direct work had decreased as a result of the forests becoming a transferred subject. This was actually incorrect even at the time, but since that date a large increase in his work has taken place in that he is now permitted to tour and advise in Indian States in the same way as in provinces. In fact both the Inspector General's and President's work has largely increased and not decreased.

Para. 78.—The combination of the two posts has not led to efficiency. The Mehta Commission was appointed in 1929 to enquire into the workings of the Institute, Sir Shanti Swarup Bhatnagar came and reported in 1938 on certain aspects of the Institute work, the Central Advisory Board on Forest Utilization was formed in 1940 and in 1941 a proposal was made for a further general enquiry committee. A succession of such enquiries does not indicate that everything is satisfactory.

Para. 79.—The Inspector General's advisory work to the Government of India (and his more recent work in the States) necessitates a man qualified from extensive experience of general forestry with high administrative experience in a province. He must be a senior officer and should ideally hold his post for five years

Para. 80.—The President's work is completely different. While he must have had extensive experience of ordinary forest conditions, it is an advantage if he is a scientist. The management of the Research Institute is, however, different from any ordinary post in the Forest Department and, having learnt the job, within reason the longer he holds it the better.

Para. 81.—There is an anomaly in the Institute. All branches, except the Utilization branch, deal with a single science or a series of closely related sciences and the branch officer is a technical expert in his work. But in the Utilization branch the various sections are as widely different as the branches in the rest of the Institute and demand completely different qualifications. The Utilization Officer is not and could not be a technical expert in all these various branches and so has become an administrative head with his own budget and his own centralized office. It thus becomes an Institute within an Institute, which naturally leads to various difficulties

Para. 82.—In my opinion the present combination of Inspector General and President has never been efficient and never will be A Vice-President has been sanctioned now for two years, who will virtually control the Institute, and the experience gained will enable a final decision to be taken whether this organization should be perpetuated.

Para 83.—I advise that the commission proposed in 1941, but postponed owing to the war, should be appointed immediately after the war On the commission, as a member of the commission and not merely as a witness, should be someone with intimate knowledge of the internal workings of the Institute.

Paras. 84 to 90.—In my opinion no great change in the organization is necessary except in the anomalous position of the Utilization branch. There are two possible solutions to this. The whole Utilization branch, together with the Chemistry and Minor Forest Products branch, both of which deal with the raw material for trade, could be separated off as a separate Institute, preferably in a trade centre. This Utilization Institute would not necessarily need a forest officer at its head but would need an experienced forest officer somewhere on the staff to act as a liaison officer with the Forest Department. I do not recommend this reorganization which I think would bring more evil than good The other solution is to split the present Utilization branch into two branches One perhaps might consist of the present Mechanical Engineering, Wood Workshops, Wood Technology and Timber Testing Sections, with an engineer as head of the branch who should, if possible, have experience in extraction and logging problems and in the designing of wooden structures, buildings, bridges, etc., and the other three existing sections of Wood Preservation, Wood Seasoning and Paper Pulp could also be combined into a second branch with a Chemical Engineer as head of it The existing sections would thus be combined into branches under technical branch officers If it is impossible to get a man experienced in logging problems and designs for wooden structures, then two men will be necessary The next step would be to combine the office of the present Utilization branch with the central office and to combine the budget with that of the rest of the Institute, thus completing the general aim underlying the Mehta Commission Report of 1929 which, however, only carried out the centralization of the rest of the Institute and not of the Utilization branch. The present administrative Utilization Officer would cease to exist.

Chapter VI

FOREST EDUCATION

Para. 91.—The Forest education necessary in India is for the training of (a) Foresters; (b) Rangers; and (c) gazetted officers.

(a) *Foresters*

Para. 92.—The arrangements are made by the provinces themselves and are satisfactory.

(b) *Rangers*

Para. 93.—Rangers have been trained at Dehra Dun since 1878 There was a school at Coimbatore and one at Poona, but the present position is that all provinces train their Rangers at Dehra Dun Most officers consider that one centre of training is desirable. The course is a two-year course.

Para. 94.—There has been a most gratifying increase in the interest in proper forest management by the Indian States in the last few years. The forecasted demand for the Rangers seats for the next five years is an average total of about 55 students of which 30 are from provinces and 24 from States. The total capacity of the existing Indian Forest Ranger College at Dehra Dun is a yearly intake of 39 students making a total of 78 students in residence at any one time. Actually a class of 39 students is already too large for the maximum efficiency of teaching. If this demand of 55 students per year were a normal perpetual demand, it would be necessary to expand the college. But it is calculated in paragraph 94 that the normal direct recruits of Rangers for provinces is not more than

21 to 24 students per year leaving a possible maximum for States of about 15 to 18. It appears therefore unwise to embark on any scheme for expanding the college at the moment.

Para. 96.—The Ranger College is now five miles away from the present New Forest. This is inconvenient. With a certain rearrangement the full class of Rangers could be accommodated in the existing Forest Research Institute building with adequate lecture rooms, laboratories, etc. It would need the building of hostels to accommodate some 80 students, two more bungalows of the type to accommodate Class II officers and two more bungalows of the Class I type. The cost should be less than the value of the site and the buildings to be disposed of in Dehra Dun. I would not, however, advise the immediate disposal of these buildings in case the very excessive demand for Rangers seats in the immediate future necessitates special Ranger classes for a few years.

(c) *Gazetted officers class*

Paras. 96 to 99.—A brief history of this training is given in *paras. 95 and 97.* The maximum accommodation is 32. There is some difficulty about living accommodation which has only been obtained by taking over and adapting certain Class II officers' bungalows. Probably a demand of 20 to 24 including the present demand of Indian States is about the normal for this class. The arrangements are adequate except that proper hostels for these students should be erected and the Class II officers' bungalows reverted to their proper use.

Para. 100.—Circular No. 4-F, dated 13 February 1892, gives rules for special continental tours for members of the Indian Forest Service when on leave in order to keep them up to date in the various problems of forestry and to encourage professional efficiency. The young gazetted officers trained at Dehra Dun would benefit by these tours at least as much as the former members of the old Indian Forest Service. It is recommended that such tours be made a normal part of training for either a selected number of, or preferably for all, gazetted officers to be made within the first five years of service but after leaving Dehra Dun and after some experience of actual forestry and forest conditions in India. Such a tour would only last for six to eight months. Facilities already exist to provide the necessary instruction, and the total expense of such a tour, including fees to the university, living expenses, touring expenses on the continent, living on tour, etc., would come to between Rs. 4,000 and 4,300 exclusive of passages from India to Europe. Government would only need to bear a proportion of this cost.

Chapter VII

CREATION OF A FEDERAL FOREST SERVICE

Paras. 101 to 105.—The Hon'ble Member, Sir Jogendra Singh, has suggested the creation of a Federal Forest Service to fill central Government posts. Work for such a service would exist at the Forest Research Institute at Dehra Dun. There is no doubt that under present conditions in times of stress the needs of the Institute take a very second place with the needs of provinces. Other work possible for such a service would be the staffing of certain forests like the Andaman Islands, Coorg, etc., which are directly under the central Government, and there should be an increasing demand for forest advisers, working plans officers and seconded officers to certain Indian States, which such a service could also supply. Such separate Federal Services already exist in Australia, Canada and in the United States of America. South Africa has a federal service only which works throughout the Union and has no forest service for the separate provinces.

Chapter VIII

MINOR FOREST PRODUCTS

Para. 106.—The development of minor forest products has been neglected in the past. They have often been collected haphazardly by petty contractors and markets have been lost through adulterated, dirty or badly graded material. After much delay the necessary staff to deal with this very valuable and important branch of work has been sanctioned for the Forest Research Institute and, although a Minor Forest Products officer has not yet been appointed at the time of writing, one is expected shortly. His first work will be to compile the large amount of material already available at the Institute, then to draw up a definite programme of work to fill the gaps in the data.

Para. 107.—There are two types of minor forest products. Those derived from more or less mature trees (and therefore taking a long time to produce) like, for instance, Kapok, *Kutch*, *Katha* Myrabolam, etc., and those derived from annual and perennial herbs which take a short time to produce like Pyrethrum, Ephedrine, Santonin, *Bhabar* grass, etc., or from young trees like quinine from Cinchona bark, rubber from Hevea, etc.

Para. 108.—The first type will usually remain as forest industries because few private individuals are prepared to grow crops which would not give a yield for 30 or 40 years. They will always be collected from the scattered trees in a forest or, if crops are grown, then they will also yield timber or fuel.

Para. 109.—But the second type, which give comparatively quick returns, are better grown as crops and not collected from the scattered trees of a forest. These offer possibilities for the individual cultivator once the preliminary research stage is finished just as it is individuals who now grow rubber, cinchona, tea, pyrethrum plantations, etc. At that stage these products pass over to the Agricultural Department.

Part II—Suggestions

Introduction

Para. 110.—Just as Part I largely applies to Indian States so do the suggestions in Part II. It is suggested that States might combine by agencies to employ a properly qualified forest adviser and possibly a joint cadre.

General

Para. 111.—The general lines of suggestions will be evident from Part I but, to make Part II complete, any suggestions already made have been repeated. It has been arranged under the same chapter headings as Part I so that each subject can be read complete by itself. Unfortunately, there must be a certain amount of overlap.

Para. 112.—The order of the chapters is logical as far as possible and not in the order of the importance of the problem. It is therefore repeated and emphasized here that the most important forest problems of India are :-

(a) Proper land management to control floods, erosion and the afforestation of the dry belt in the west. Connected with this is the defining of those areas where correct land management is necessary for the physical well-being of the country. This may affect private ownership.

(b) Second only to the above is the provision of small timber and fuel for the general agricultural village consumer in India both to provide for his direct wants and at the same time to release cowdung for manure and the correct distribution of this forest throughout India.

Para. 113.—A small reconstruction forest policy committee should be set up in each province to draw up the provincial programmes. The heads of these committees should then meet to make a combined programme for those items which coincide.

Chapters II and III. Government in relation to Forestry and Existing Forest Policy

Para. 114.—The principles which govern the existing forest-policy of India should be endorsed. These are :

(a) The areas necessary for the preservation of the general climatic and physical conditions of the country must be kept as forest.

(b) The minimum amount of forest necessary for the general well-being of the country must be preserved or created.

Subject to (a) and (b) above :

(c) Cultivation is more important than forests.

(d) The satisfaction of the wants of the local population free or at non-competitive rates is more important than revenue.

(e) After the above have been satisfied, the object of management is the realization of the greatest possible revenue consistent with the principles of forest management, that is to say on the principle of sustained annual yield.

Para. 115.—The existing forest policy does not legislate for the allocation of land to fulfil (a) above, nor does it lay down the percentage either for India or for any province to fulfil condition (b) above. These omissions might be rectified.

Para. 116.—Land necessary for the preservation or improvement of the general climatic and physical conditions in each province should be classified and allotted to class (a) Protection forests and properly managed. The majority will be under some form of forest management. It should be allotted to class (a) even though it may also be allotted to classes (b), (c) and (d).

Para. 117.—The minimum area of forest land for India, and as far as possible for each province, should be laid down as between 20 and 25 per cent

Control of private forests

Para. 118.—A Private Forest Act should be drafted to prevent the devastation of forests falling under class (a) Protection forests. It should legislate for all stages of control depending on local circumstances and for the actual acquisition of land when necessary in the general interest.

Chapter III. Existing demands and supplies of forest resources

Management of reserved forests

Para. 119.—There is nothing to suggest except the continuance of the present forest policy which has actuated Indian forest management since its inception, that is to grow those species most suited to the locality and which are in general demand on the principle of the sustained yield, and with the object of attaining a normal increment in the shortest possible time.

Para. 120.—But owing to over-fellings on account of the war demand, the working plan position should be examined immediately after the war and either fresh working plans or temporary rough working schemes prepared immediately.

para. 121.—The possibility of creating special working plans circles either in a province or in combination with a neighbouring province should be examined. The minimum number of working plans to make such a circle worth while is ten plans revised on a ten-year cycle, and anything over that makes it even more worth while.

Para. 122.—The disposal of the Defence Department stocks after the war must be controlled. The Board of Forestry in 1942 had already passed this resolution:

(a) The release of Defence Department stocks after the war must be controlled by a disposal board or some such agency and the Board of Forestry emphasizes that the Forest Department must be adequately represented in any planning for such disposal.

(b) The Board of Forestry further advises that, in consultation with railways, steps should be taken to stabilize sleeper prices after the war.

Ordinary agricultural village consumers

Para. 123.—The provision for their wants for small timber and fuel is most important. Map I shows the existing areas under the Forest Department which, under existing conditions, are likely soon to be the only forests left in British India. Map II also includes as far as possible properly managed forests in both British India and in Indian States, so that this may show the total forests likely to remain in India in the near future under the present conditions. It will be seen that there are vast areas devoid of forests where the wants of the ordinary agricultural villager are entirely unsatisfied. The question arises whether land is available which is either covered with forest of a sort though not under the Forest Department and not at present properly managed.

Para. 124.—In *para. 124* the land both in British India and the States is classified as cultivated, uncultivated and forest. Although the figures may not be quite accurate, it will be seen that there are 106,000 square miles of land classified as forest which is about 13 per cent of the total area of British India. A further 144,000 square miles is classified as cultivable waste and another 144,000 square miles as not available for cultivation. Out of this it is probably possible to find somewhere between 70,000 to 100,000 square miles of properly distributed forest which would solve most of the problem.

Para. 125.—Map III bears this out compared with Map II. The cross-hatched areas do show where some sort of forest exists and, if taken over by the Forest Department and properly managed, it would go a long way towards solving this pressing problem for the ordinary village consumers.

Para. 126.—But even Map III shows a large area bleak of any type of forest from Bengal through Bihar, the United Provinces and the Punjab and down through Rajputana, parts of Bombay and Hyderabad. But the table in *para. 127* shows that Bengal has 9,000 square miles of cultivable waste and 15,000 square miles not available for cultivation compared with the forest area of only 7,000 square miles; Bihar has 8,000 square miles of cultivable waste and nearly 10,000 square miles not available for cultivation compared with 10,000 square miles of forest; the United Provinces has over 15,000 square miles of cultivable waste and another 15,000 square miles not available for cultivation compared with 15,000 square miles of forest; the Punjab has 27,000 square miles of cultivable waste and 20,000 square miles not available for cultivation compared with 3,000 square miles of forest; the North-West Frontier Province has 4,500 square miles of cultivable waste and 4,000 square miles not available for cultivation as against 550 square miles of forest; Bombay has 1,400 square miles of cultivable waste and nearly 9,000 square miles not available for cultivation compared with its 13,000 square miles of forest. There are therefore in these provinces great possibilities of increasing the area under forests to supply these particular wants of the general agricultural villager.

Para. 127.—Moreover, in these same provinces, in Bengal there are possibilities of properly managing the private forests (see the report of the West Bengal Committee). In the United Provinces, there are opportunities for the control of private forests of mango groves, etc., (nearly 1,100 square miles) of canal banks, roadsides, railway lands, village wastes, etc. Properly managing the mango groves alone would go far towards solving the problem. The United Provinces had sanctioned such a scheme and formed a Forest Development division in 1938. It had already extended to 12 out of the 48 districts in the province with something like 3,500 acres of successful plantations. It was intended to form a new unit or division every two or three years till there were four or five divisions covering all the districts in the plains, though the war has held up expansion. It has been estimated that approximately 10,000 square miles of forest could be created in this way, forming a separate Forest Development circle rather like the Eastern circle of the Punjab. In Bihar, there are at least 3,000 square miles capable of being used for this particular supply and some 7,500 square miles of private forests which, if properly managed, would help considerably. In the Punjab the Rawalpindi *quamas* could again be taken over by the Forest Department. A policy for the development of village forests exists in Kangra, Hoshiarpur and Ambala and the Soil Conservation circle is doing what it can. In Bombay, there are something like 2,000 square miles under the Revenue Department and there are something like 4,000 square miles of what is called 'unassessed uncultivable land', all of which could be used to help in solving this problem.

Para. 128.—There seems plenty of scope for bringing the forests up to the necessary percentage and properly distributed to supply the wants of these general agricultural village consumers.

Para. 129.—In each province the land should be classified from the forest crop point of view rather than from the agricultural crop point of view showing the 'waste other than fallow on which minor forest could be grown' and 'land not available for forest cultivation'. Each head should be divided into more detail showing private forests, village waste, groves, etc; while that given as 'land not available for forest cultivation should also be classified as roads, buildings, water, barren lands (ravines, *usar*, sand dunes, rocks, etc) This classification is a necessary basis for all this planning. It need not be particularly accurate nor need it have a special agency to collect it. The agency which collected the statistics in *para. 124* could be used to collect this data if it does not already exist Forest officers could then examine the classification and pick out the area needed. The final result would not be large blocks of forest but small scattered areas which is exactly what is needed.

Para. 130—The question of grazing has not been mentioned. The cattle problem, though not directly part of the Forest Department's work, is so mixed up with forests that it must be mentioned. Excessive grazing is the cause of much of the destruction of forests in India. If the schemes outlined above are to succeed, such grazing must be prevented while the crops are being established, Protection will, however, give better grazing than formerly, and one experiment in the United Provinces on *usar* land increased the dry hay production from 2½ maunds per annum under continuous grazing to about 17 maunds per annum under proper regulation. Moreover, these minor forests will in fact give good grazing for a large portion of their short rotations of 15 to 20 years

Para 131.—A large quantity of uncultivable land under this scheme would be classified as the fourth type of forests (d) Pasture In the United Provinces alone there are some 14,000 square miles of this type The uncontrolled grazing on this area, which is extremely poor in quality, must be controlled if the country is to become prosperous This part of the programme depends on propaganda and is a slow process

Para. 132—This proposal for a largely expanded area under forests is the first proposal made to cost much money. No total figure of cost can be given but is unnecessary because the staff does not exist to carry it out at once The Punjab Soil Conservation circle costs about Rs 3½ lakhs per year. Roughly Rs 1½ lakhs are spent on conservancy and works and Rs 4 lakhs on establishment. The establishment consists of a Conservator, 11 gazetted officers, 19 Forest Rangers, 52 Deputy Rangers and Foresters and 370 Forest Guards A great deal could be done if each province employed a similar staff and the most that any province could employ to begin with would be about double that staff. An approximate figure therefore can be put as between Rs 5 and 10 lakhs per annum.

Chapter IV.—Floods, erosion and desiccation

Para. 133—The proposals already made will go far towards solving this problem. *Para. 116* has already recommended a classification of the forests and especially its allotment where necessary to class (a) Protection forest. Land at present not under the Forest Department should be classified in the same way and again it can be done by the same organization which obtained the figures given in *para. 124*. At the same time it should be recorded whether the existing land management is suitable for the prevention of erosion or not. If not suitable, it should be made suitable *Para 64* shows that forest land with normal ground covering is probably the best land management to prevent erosion and floods while well-managed pasture is good. Grass land is moderately good to prevent run off, but is distinctly bad for the prevention of erosion After such classification it will probably be found that much of the land is either forest, pasture, grass land or bare land and such land would probably be better put under the management of the Forest Department Much of it will coincide with the land to be managed under *paras. 123* to *129* for the production of minor forests, and much of it would fall under the portion mentioned in *paras. 130* to *132* where grazing must be controlled, not only for the sake of the grazing but also for erosion It is not for me to suggest a solution for land which falls under agricultural crops, but there is no doubt that most of the problem of India is (a) afforestation where possible, and (b) proper control of grazing where afforestation is impossible. Proper control of grazing will in fact convert much of the area into forest naturally.

Para 134—In *paras. 59* and *70* it was stated that desiccation was probably advancing eastward from the dry belt of less than 30 in rainfall. The creation of the minor forests under *paras 123* to *129* to a large extent, would automatically solve this desiccation problem (please see the cross-hatched areas of Map III). Much of it falls within the boundaries of Indian States Below 15 in rainfall forests will be difficult or impossible to start without any irrigation, though some very dry species can be started without irrigation down to 10 in rainfall. Below that rainfall trees cannot be started without irrigation in their early years

Para. 135.—An officer should be appointed at the centre to go into this whole question of floods, erosion and desiccation Such officers are also wanted in each province. A special Soil Conservation Department has been suggested, but I do not agree with that view. If the projects suggested in this note are carried out, it will be found that much of the land would fall under the Forest Department, and much of the flood and erosion control part of it will automatically become merely one of the objects of management of this greatly expanded forest area in exactly the same way as it is the first object of manage-

meet of any area under the Forest Department today. I consider the whole of this work should be under the Forest Department, though it would consult and possibly employ agricultural and irrigation officers as well. In Chapter VII the creation of a Federal Forest Service was discussed. If this were created much of this flood, erosion and desiccation control would automatically come under it. It could in fact be used to report on the problems in provinces and advise.

Para. 136.—There are few problems inside the reserved forests under the Forest Department, though the area under them is often too small to affect sufficiently the whole problem. The allocation of land mentioned in *para. 116* above will probably show that much of the land falls under the proposed expanded Forest Department Certain provinces are already taking steps about this. A Soil Conservation circle exists in the Punjab, an erosion range is proposed in the North-West Frontier Province, an anti-erosion officer is proposed in Orissa, Madras is considering the question of control of private forests, and Bengal has made recommendations in the Report of the West Bengal Forest Committee of 1939.

Chapter V. Forest Research

Para 137—The proposals have already been made in Part I, Chapter V. They are :

(i) Separate the Inspector General of Forests from the President, Forest Research Institute. The Inspector General would then work at the headquarters of the Government of India like all other heads of departments. The Inspector General should be made more use of by the Political Department for advice on all the forest problems of Indian States. If a Federal Forest Service were created, these officers would also be available for this purpose.

(ii) The appointment of a commission as soon after the war as possible to enquire into the best organisation for the Forest Research Institute.

(iii) Either the complete separation of the Utilization branch together with the Chemistry and Minor Forest Products branch as a separate Institute, or, in my opinion better, the division of the present Utilization branch into two branches, each with a technical expert at its head, and the centralization of its office and budget with the rest of the Forest Research Institute under the direct administrative control of the President Suggested grouping of the Utilization branch might be one branch consisting of Mechanical Engineering, Wood Workshops, Wood Technology and Timber Testing and the other consisting of Wood Preservation, Wood Seasoning and Paper Pulp There must also be in the Institute one officer capable of dealing with structural designs in timber and one to deal with problems connected with sawmills, transport, logging, etc. He might possibly be the head of the branch mentioned above consisting of the Mechanical Engineering, Wood Workshops, Wood Technology and Timber Testing.

Chapter VI: Forest Education

Para 138—Again this is merely a repetition of what has already been given in Part I, Chapter VI, Forest Education. The Foresters' education should remain with the provinces as at present.

Para. 139.—The training of Rangers should be centralized at Dehra Dun as at present, but the Dehra Dun class should be moved out to New Forest. The only extra buildings necessary will be hostels for about 80 students, two Class II officers' bungalows and two Class I officers' bungalows, the cost of which would be more than covered by the value of the present site and buildings in Dehra Dun I would advise, however, that this site be kept on for a few years in case extra classes are needed immediately after the war for the training of Rangers for the expanded areas indicated in these proposals

Para. 140.—The training of gazetted officers is satisfactory but it is suggested that the continental tours for forest officers be extended sufficiently to allow a selected number of gazetted officers, or preferably all gazetted officers, to proceed to Europe some time during the first five years of their service.

Chapter VII. Creation of a Federal Forest Service

Para 141.—If created there would be certainly work for this service This would be work at the Dehra Dun Forest Research Institute, the staffing of areas under the Central Government, as advisers and seconded officers to Indian States and agencies and as the Central Soil Conservation Department.

Chapter VIII. Minor Forest Products

Para. 142.—As the branch has not yet obtained the staff recommended for this research, there is little to recommend except to stress the importance of both research and development of these very valuable and important products. Information in existence must be compiled and blanks in it filled. For the second type of quick-return minor forest products, special research is necessary on methods of growth, cultivation, etc. Provinces should also themselves investigate and record all the industries connected with minor forest products. It should be a definite problem for their research officer or utilization officer whichever they may happen to possess. Burma has already sent one of its officers to the Research Institute to learn as much as possible about the problems of these minor forest products for the reconstruction of Burma.

POST-WAR FOREST POLICY FOR INDIA

Part I.—Review of Present Conditions

INTRODUCTION

1. This note on the post-war forest policy for India has had to be written in whatever time I could find during the last three months in addition to other work. It has therefore been impossible to do real justice to this vast and important subject. The note only gives certain principles and perforce avoids all detailed solutions.

The figures given are as accurate as I could make them, but they have been hurriedly compiled from whatever sources were readily available and I cannot therefore guarantee their accuracy. I believe, however, they are approximately correct, correct enough at any rate to illustrate the forest problems which India has to solve.

2. In dealing with this forest policy for post-war reconstruction, I have confined myself to British India. I would point out, however, that much of what I have written is in fact applicable to the forests of Indian States. Some of these manage their forests on as high a standard as the management in British India, but in others forest management is backward. Although there are plenty of areas in British India where erosion is as bad as anywhere and where vast numbers of villagers are unable to supply their wants for forest produce, these conditions apply with at least equal force to a very large area of Indian States. I suggest that much of this reconstruction policy could with advantage be adopted by Indian States.

Chapter I

THE GOVERNMENT IN RELATION TO FORESTRY

3. To enable a community to live together it is necessary for every Government to make laws. Freedom is a relative term and under most civilized Governments it is largely only freedom to do what you are told. Governments try to give the individual sufficient freedom for personal development and activity, but at the same time only in so far as that freedom of individual action does not encroach upon the rights of his neighbours and their equivalent freedom of action. Nor can Governments permit acts of individuals in a community which harm the general well-being. This principle of the greatest good to the greatest number is specifically laid down as a principle of the existing forest policy of the Government of India.

4. Government, moreover, must frequently manage various institutions for the benefit of the people as a whole, where it would obviously be impossible for an individual, or even a small community of individuals, to undertake the necessary work. Examples are the postal service, the army, the navy, etc. Even though a joint stock company might provide the large capital involved in certain undertakings, such a company is formed with the definite idea of making the maximum profit and not for the general welfare of the community.

5. Forestry, which grows a crop taking normally anything from 50 to 150 years to mature, keeps an enormous capital locked up in the growing stock, quite apart from the considerable amount which may be required for development on roads, buildings, sawmills, etc. In addition, there are many occasions when not only has an enormous capital to be invested, but when no return can be expected from that capital for many years and a full return, as I have said, not for 50 to 150 years. A private owner, and even a company or a commune, is most unlikely to invest capital under those circumstances. A private owner (and in this is included the ordinary timber company), and to a lesser degree a commune or corporation, is concerned with direct individual benefit. As a rule he aims at realizing the greatest profit from the forests and this results more often than not in felling everything saleable in a comparatively short period, resulting in the more or less complete devastation of

the forest. Even private owners with family traditions to uphold may deliberately realize the whole capital invested in the growing stock (which is devastation so far as forestry is concerned) because other investments offer an apparent and immediate better return on the capital than forestry. Even the most enlightened private owner, at some time of particular expense or stress, finds his private interests so opposed to the interests of the forest that the forest is sacrificed to a greater or lesser extent. This has been the experience in the vast majority of forests of every country in Europe and there has been virtually a breakdown of private forest ownership in the United States of America. It has also been the experience in India where individual trading concerns devastated and ruined many forest tracts in India before Government took control. Moreover, during this war reports from everywhere show that private forests are being so over-felled that many have virtually disappeared. Private forests in India had been steadily disappearing for years before the war. Ideally a Government should take over all the land and forest necessary as Protection forests [class (a) of India's present forest policy to be described later], whether they are forests in fact or only 'legal' forests consisting of Pastures [class (d) of India's present forest policy], and, in addition, land or forests to produce timber or agricultural timber [classes (b) and (c) of India's present forest policy], to make up the minimum estimated forest needs of a country. But such a procedure would often interfere more with the rights of the individual owner than any Government would wish. Privately-owned (and communal or corporation) forests should be subjected to certain forms of Government control in so far as is necessary for the general needs of the community at any rate up to the minimum area required, just as the rights of user granted at the time of settlement in reserved forests are never so excessive that the rest of the nation is deprived of its legitimate rights.

6. The above principles should be applied to conditions in India. Government should interfere as little with private or communal ownership as is consistent with the general well-being of the country, but as soon as that is threatened private ownership should be controlled. The most important forests for the general well-being of the community are those which fall under class (a) Protection, and of these, the most important are the areas situated in mountainous or hilly country, for example the Himalayas, the Central Indian hills, etc. 'Forests' in such areas of course often include class (d) Pastures, which may in fact be forests only in name, but which, for these climatic and physical reasons, are better under the management of the Forest Department. The Indian Forest Act legislates for Government control over private lands falling under this class (a), but the power has not been sufficiently used and the legislation itself needs revising to enable Government to take control of an area before it is already ruined.

7. The next step should be to exercise control over other private forest land at least up to some fixed minimum percentage of the total area of a province and of India as a whole. For the sake of consistency it would at first be better to exercise the necessary control over all private forest land. Even then the total percentage of forest land is likely to be insufficient. It should not be forgotten that while the needs of the 'general consumer' (see Chapter III) can be supplied by forests a considerable distance from the centre of consumption, the equally, if not more, important needs of the local agriculturist for small timber and fuel can only be supplied by material growing more or less in his immediate neighbourhood. Such produce is not valuable enough, and the local agriculturist is too poor, to bear the cost of transport over any but very short distances.

8. The main difficulty over a large portion of India is to fulfil the legitimate wants of those villagers whom I have called 'ordinary village consumers' (see Chapter III), that is to say, those who at present have no forest land anywhere near them to fulfil their wants. It is this vast number of ordinary villagers who cannot get sufficient forest produce for their minimum needs and of necessity use cowdung as fuel, the whole of which ought to be available for its more legitimate use as manure, which constitutes the most pressing problem

in the future forest policy of India. It is sometimes argued that for certain domestic purposes cowdung is a more efficient fuel than wood. Even if this were true, which I take leave to doubt, it is still certain that very large quantities of cowdung are burnt which could very easily be replaced by fuel if it were available, and in fact even for those slow-burning domestic purposes for which cowdung is sometimes considered the only suitable fuel, wood first reduced to charcoal dust and then made locally into briquettes serves the purpose equally well.

9. This small timber and fuel part of the problem will be the most difficult of solution. Even after a survey and a classification of all possible land available for this purpose, it may be found that there is still insufficient land available for forestry to fulfil the minimum legitimate needs of the agricultural villager, and even if the area is sufficient, it will be found that much of it at present contains no trees, is over-grazed and is under no management at all. This will mean either the acquisition of much of the area and its afforestation and management by the Forest Department, or by propaganda, compulsion and then advice and help to get it properly managed either by a communal body (like a panchayat) or by the local private owner.

10. As I have already said, some sort of control of private ownership has been found necessary in most European countries and in many other parts of the world. This control naturally varies, but the following may be mentioned as forms of control which have been exercised:

(i) *Prevention of mere destruction* but without any provision for good management. This is the minimum compulsion necessary for all areas of land falling under class (a) Protection forests.

(ii) *Prevention of trade in woodlands.*—This is to prevent an owner selling forest land to others who will destroy it for immediate profit. Fellings are usually forbidden for a certain number of years after such a property is sold.

(iii) *Compulsory regeneration of felled areas* usually within a specified number of years. This is a step further than mere prevention of devastation but does not of itself mean good forest management.

(iv) *Compulsory management on the method of sustained yield.*—This is again a further stage and at least ensures that forest of a kind will be maintained in perpetuity.

(v) *Restriction on the rotation of felled trees.*—This, while it does not ensure the best management, does at least mean that the forest cannot be cut over rapidly at short intervals. Cutting over at short intervals decreases soil fertility and is really only devastation but in a very modified form.

(vi) *Control of actual silvicultural operations.*—This begins to approach proper forest management. It might easily cover, for instance, the prevention of a system of clear felling in any areas falling under (a) Protection forests.

(vii) *Compulsory proper forest management.*—This means the maximum restrictions on the private owner but is undoubtedly the best for the general well-being of the country and is the minimum that should be enforced in any area falling under (a) Protection forests. It is probably also what ought to be done for all the forests of class (c) Minor forests, necessary for the supply of the ordinary agricultural villager, although naturally the object of management would be very different from that in either (a) Protection forests or (b) Timber forests and, as a consequence, would in practice mean far less restriction on the wishes of the owner. Thus, in class (a) forests rotations would almost always be long and silvicultural systems might not be those giving the greatest profit, but in class (c) forest rotations would be very much shorter and systems very simple.

(viii) *The ultimate stage* of control, while not destroying private ownership, would be for the Forest Department to take over and manage the estate on behalf of the owner on various financial terms.

Chapter II

EXISTING FOREST POLICY*

11. The existing forest policy for India, evolved in 1894, nearly 50 years ago, only reduced to writing what had been the underlying aims of the Indian Forest Department more or less from its foundation in 1865 nearly 80 years ago. The principles laid down in that forest policy can hardly be bettered, and a detailed study of the resolution is essential for anyone dealing with forest matters. Its contents are summarized below, using for ready reference the same paragraph numbers as in the original. This forest policy, however, applies only to Government lands, usually, though not necessarily, under the Forest Department. In making this summary the term 'Government forests' is used instead of the 'State forests' of the original, because the term 'State forests' now usually means those belonging to Indian States. What follows then is merely a condensed statement by paragraphs numbered as in the original, of the existing forest policy of the Government of India, which, as late as 1937, was accepted by all provinces and by several Indian States. Where additional remarks are inserted, they are in brackets.

Para. 2.—Government forests are administered solely for the public benefit both local and general. This usually means restricting rights either for the right-holders' own benefit or for *the general benefit of the greatest number.*

Para. 3.—Government forests are classified as:

(a) Those necessary on climatic or physical grounds (prevention of floods, erosion or desiccation, *i.e.* Protection forests)

(b) Timber forests (principally for timber supply and revenue).

(c) Minor forests (principally to supply local needs).

(d) Pasture forests.

(The above classification indicates the function of the forest and has nothing to do with the legal classification of forest under the Forest Act as Reserved, Protected, etc. The classification is really to indicate a policy for the management of each class. A given forest may easily fall into more than one class above and, so far as I know, no attempt has ever been made to allot Indian forests to the above classes though it is the guiding principle underlying working plans.)

Para. 4.—(a) *Protection forests*: These are usually situated in hilly country and often contain the headwaters of rivers. The interests to be protected by these forests are beyond comparison more important than any rights which may be restricted. (The population in the whole Gangetic plain, for example, is affected by the management of the Himalayan forests or that of the Punjab by the forest management of Kashmir, Chambs, etc.)

Para. 5.—(b) *Timber forests*: These are usually large tracts of forest land with few rights and are to be managed as sources of revenue to Government. But even in these forests revenue has to be subordinated to the reasonable satisfaction of the wants of the local people free or at low and not competitive rates. Small timber for the local agricultural population is more important than revenue.

Para. 6.—Except under certain conditions enumerated below, agriculture is more important than forestry, and, where necessary, even these timber forests should be given up for agriculture where necessary and then disforested. This even applies to land already declared Reserved forest under the Forest Act.

Para. 7.—*The exceptions to the above are all based on the principle of the greatest good to the greatest number*: Cultivation must not reduce the forest land below the minimum requirements of the country. It must be genuine

* Cir. No. 22. F., dated 19 October 1894.

cultivation and not an excuse for creating pastoral villages. It must be permanent cultivation and shifting cultivation will not usually be permitted. A forest must not be honeycombed with patches of cultivation. Cultivation must not be allowed when the resultant disforestation would endanger climatic or physical conditions, nor must it destroy the forest when its own existence depends on it. (Destruction has happened in vast tracts in India where all forest has been completely destroyed to the detriment of agriculture.)

Para. 8.—Although Timber forests are usually fairly free from rights, rights come before revenue where they exist. Rights must be restricted where necessary to prevent the destruction of the forest but not merely to increase revenue.

Para. 9.—(c) *Minor forests*: These are real forest lands but contain only inferior growth. Still they are sometimes important enough to be managed for revenue and therefore fall partly under the class (b) Timber forests. (Also of course a Minor forest might be artificially converted into Timber forest). But real Minor forests are chiefly useful to supply fuel, fodder and grazing for the local population and should be managed with those objects. The first object of management, however, is to preserve the forest, the second object is to supply the necessary produce to the people and any revenue is subordinate to both objects.

Para. 10.—There is no idea of forgoing all revenue from the Minor forests. The wants of the local people come first when necessary, but when these Government lands only supplement other pastures, then revenue is justifiable. Even then produce should be supplied to the local villagers at low rates.

Para. 11.—Fuel and fodder reserves are recommended. The supply from such reserves is entirely for the people and for the local people rather than more distant people, but it is no use increasing a supply in such a form that the people will not use it. These Minor forests, even when made Reserved forests, need not necessarily be managed by the Forest Department.

Para. 12.—(d) *Pastures*: These are often forests only in name. These may be made Reserved forests under the Forest Act for convenience but are not for that reason to be preserved as forests or to be put under the Forest Department. The agency which manages them is for convenience only.

The following remarks apply to pasture lands under the Forest Act whether under the Forest Department or not, and also to all Crown waste land whether under the Forest Act or not. Local interests are paramount and any consideration of revenue very small.

Para. 13.—With a *ryotwari* settlement unoccupied fields belonging to Government, where trespass is forbidden, are often scattered among occupied fields and are often the only source of grazing. Under such circumstances they are usually better not under the Forest Department.

Para. 14.—Grazing is not primarily a source of income from these lands but all grazing revenue need not necessarily be relinquished. Such lands are often better managed by the local community taking the grazing at a moderate price.

Para. 15.—Class (b) Timber forests, should usually be 'reserved' forests. Class (c) Minor forests and class (d) Pastures are often made 'protected' forests and rights properly recorded. In Reserved forests no new rights can arise as they can in Protected forests. Rights recorded under Chapter II of the Forest Act for 'reserved' forests are conclusive, those under Chapter IV for 'protected' forests are only presumptive. The chief difference between 'reserved' and 'protected' forests is that in reserved forests everything is an offence which is not permitted while in a protected forest nothing is an offence which is not prohibited. Land should be created protected forest rather than reserved forest unless public interests are sufficient to justify the creation of reserved forest.

For class (c) Minor forests and class (d) Pastures, each separate area should be considered whether it need be under the Forest Act at all and then whether it might not be Protected forest rather than Reserved forest. (This may have been unwise. Not putting such areas under the Forest Act undoubtedly explains the ruin of quite large areas.)

Para. 16.—This paragraph reiterates the need for satisfying the requirements of the local population and lays down that forest working plans must provide for the satisfaction of rights.

12. The outstanding principles of the above policy are:

(a) that first and foremost the preservation of the climatic and physical conditions of the country comes before everything else;

(b) that the preservation of the minimum amount of forest necessary for the general well-being of the country is second only to (a) above.

But provided the above two conditions are fulfilled, then

(c) cultivation comes before forestry;

(d) the satisfaction of the wants of the local population free or at non-competitive rates comes before revenue, and

(e) after all the above are satisfied the realization of revenue to the greatest possible extent is permitted.

Comments on the existing forest policy

13. As a policy for Government forests it is still an excellent exposition of general principles. It should be emphasized that the classification of forests into (a) Protection, (b) Timber, (c) Minor forests, and (d) Pastures has nothing to do with the legal classification under the Act of Reserved, Village and Protected forests. In actual fact there are Reserved forests falling under all four heads of the above classification and the legal status of the forest is for convenience and not a classification of function.

14. Moreover, the above classes are not exclusive. A very large proportion of the forests falling under classes (b), (c) and (d) also fall under class (a), or in other words, if they ceased to be forest land, they would affect the physical well-being of the country at large. Usually, however, the objects of management of a forest under class (a) are automatically fulfilled by proper management to fulfil the objects under classes (b), (c) and (d). The net result of this is that in any plan of management for forests of classes (b), (c) and (d) under the heading 'Objects of Management' the first is usually recorded as 'preservation and regulation of water supply', thus automatically fulfilling the objects of forests of class (a).

15. The above forest policy does not mention the principle of sustained yield. Actually, however, with the concurrence of the Government of India (see for instance as recently as F.-56-3/35-F., dated 8th January 1936; 'it is undesirable to permit a departure from the principle of sustained annual yield which has been the fundamental principle of Indian forestry since the foundation of the Forest Department in India'), the Forest Department in India has since its inception managed all forests under its control under the principle of sustained yield, that is to say, to ensure that the annual amount of forest produce does not decrease from year to year, that it is approximately equal each year and that the yearly amount rises gradually till the maximum possible yield from the soil is obtained. The reasons for this principle are many and obvious but only three need be mentioned here, namely:

(a) a stable industry cannot be established with excessive fluctuations;

(b) the number of people dependent on forests for their livelihood, directly or indirectly, is so great that social conditions would be upset with large fluctuations;

(c) Government budgets necessitate approximately equal revenue.

Forest area by ownership (in square miles).

Province	Total area	Type of Forests.	The State			Corporate bodies	Private individuals	Total	Percentage of total forest area (col. 10) to area of province (col. 2).	Remarks.
			Dedicated to timber production	Other forests	Total					
1	2	3	4	5	6	7	8	9	10	11
Ajmer-Merwara	2,367	1. Merchantable.	...	73	73	...	...	73	3	
		2. Unprofitable or inaccessible.	...	...	...	...	...	...	...	
Andamans and Nicobars	2,508	1. Merchantable.	1,408	881	2,189		...	2,189	87	
		2. Unprofitable or inaccessible.	...	...	...	...	...	...	...	
Assam	56,446	1. ...	22,841*	...	22,841	...	...	22,841	41	
		2. ...	...	...	...	...	...	...	...	
Baluchistan	52,925	1. ...	...	...	...	...	...	...	...	
		2. ...	...	2,218	2,218	...	...	2,218	4	
Bengal	78,708	1. ...	6,339	877	7,216	...	...	7,216	9	
		2. ...	...	5,077	5,077	...	1,596	6,673	8	
Bihar	60,948	1. ...	1,976	113	1,388	...	2,850	4,242	6	
		2. ...	425	521	946	...	4,729	5,675	8	
Bombay	76,026	1. ...	6,554	1,061	7,615	...	...	7,615	10	
		2. ...	...	5,305	5,305	...	...	5,305	7	
C. P. & Berar	98,673	1. ...	12,403	5,520	16,229	...	15,268	33,497	34	
		2. ...	2,010	2,405	4,846	...	9,044	13,889	14	
Coorg	1,582	1. ...	371	186	557	...	203	760	48	
		2. ...	146	132	278	...	144	422	27	
Madras	125,163	1. ...	4,201	7,302	11,503	...	5,482	16,985	14	
		2. ...	2,338	4,967	7,305	...	9,329	16,634	13	
N.-W.F.P.	13,090	1. ...	146	18	164	...	35	199	3	
		2. ...	...	240	240	...	93	334	3	
Orissa	32,308	1. ...	208	813	1,021	...	452	1,526	5	
		2. ...	1,136	..	1,136	...	1,276	2,412	7	
Punjab	96,830	1. ...	814	725	1,539	...	202	1,771	2	
		2. ...	1,133	3,599	4,732	...	...	4,732	5	
Sind	47,165	1. ...	1,135	...	1,135	...	...	1,135	2	
		2. ...	...	...	...	...	...	...	...	
United Provinces	106,248	1. ...	3,491	700	4,191	...	1,221	5,412	5	
		2. ...	...	10,084	10,084	...	1,876	11,960	11	
	Total .	1. ...	61,387	18,382	79,769	...	25,719	105,488	12	
		2. ...								
	Total .	1. ...	7,295	35,004	42,272	...	28,102	70,374	8	
		2. ...								
	858,375	Grand Total	68,636	53,386	122,021	...	53,821	175,842	20	

*Actually, Assam has not classified its area.
(The figures for Assam were not classified. It has been assumed that it is all merchantable, though this will almost certainly give too big a figure.)

19. Summing up, it would appear that about 20 per cent of British India is covered with forest land of a sort including both private and Government forests and, for merchantable forest only, the percentage is 12 per cent.

Inaccurate though these figures may be, it is certain that 12 per cent of forest land, other than unprofitable or inaccessible, is too little.

But almost all the private forest is mismanaged, is disappearing or has disappeared. Unless steps are taken to preserve these private forests compulsorily, they cannot be reckoned as part of the forests of India.

20. Taking the State forests alone, there are 122,000 square miles or 14 per cent of the total. This area is far too small even as a total. But even this is not a final figure. Of this, nearly 24,000 square miles are not under the control of the Forest Department, but are under the Revenue Department, ryots, panchayats and municipalities. Of this 24,000 square miles, 2,100 square miles are Reserved forest, 9,000 square miles are Protected forest and 13,000 square miles are unclassed forest. Almost the whole of the 13,000 square miles of the unclassed forest is disappearing and a good deal of the Protected and Reserved forest.

Of the 122,000 square miles, only 80,000 square miles or 9·3 per cent of the total area of British India is covered with forest classed as merchantable and even this assumes that the huge area of 16,000 square miles of unclassed forest in Assam is merchantable—a most unlikely assumption.

21. It is extremely difficult to give any figure of what the percentage of forest land in a country should be. The following table gives the actual percentages in certain European countries and incidentally shows the percentage of forest under various types of ownership.

European countries. Percentage of total land area under Forest, and classification of forest areas according to ownership

(Chiefly from figures published by the Economic Committee of the League of Nations, 1932)

Country	Forest area as percentage of total land area	Classification of forest areas according to ownership		
		State or Crown forests	Communal or public corporation forests	Private and company forests
	%	%	%	%
Austria	35	24	9	67
Belgium	18	6	32	62
Czecho-Slovakia	34	11	25	64
Denmark	9	24	20	47
Finland	74	40	2	58
France	19	14	21	65
German Reich (excluding Austria)	24	33	20	47
Great Britain	5	12	1	87
Greece	19	..	..	..
Hungary	13	..	..	..
Italy	20	3	32	65
Latvia	27	84	2	14
Netherlands	*8*	*31*	..	*69*
Norway	21	15	7	78
Poland	23	32	1	67
Portugal	22	..	..	..
Rumania	24	29	31	40
Russia (European)	44	100	..	..
Spain	14	..	..	..
Sweden	55	38	2	60
Switzerland	23	5	70	25
Yugoslavia	..	47	19	34

Copied from page 5 of *Forestry and State Control* by R. S. Troup.

22. An average of all these gives 26 per cent. This may not be a scientific method of arriving at the correct percentage of a country which ought to be covered in forest, but it is at least a figure. It will be seen that certain countries with far less than that percentage are heavy importers of timber and are essentially flat or gently undulating countries over all or much of their area, with an even and gentle rainfall, *viz.*, Great Britain, Denmark and the Netherlands; others which are mountainous, like Italy, Spain and Greece, are notorious for floods and erosion over much of the country.

23. Considering the Indian climate and the general demands of the agricultural villagers, it is likely that this figure might be taken at any rate as a rough minimum guide—say 20 to 25 per cent. This should be considered as the minimum area of properly managed forest, properly distributed for protective purposes and to supply the general consumer and the village consumers, the majority of whom would then become 'local' village consumers (see Chapter III).

24. It will also be seen from the table in *para. 18* that even taking the total of both private and Government forests and including both merchantable and unproductive areas, many individual provinces have far less forest land than one would ordinarily consider necessary.

25. Nor is the distribution of the forests good. Except for the Central Provinces, Bombay and Madras, roughly speaking south of a line from the Gulf of Cambay to Calcutta, the forests under the Forest Department consist of a narrow strip in the north in and along the foot of the Himalayas, the forests in the east of Assam, the Sunderbans and a few odd patches down the Indus, in the south of the United Provinces and in Bihar and Orissa. Map I shows this distribution clearly It does not unfortunately tell the full truth because it omits the forests of Indian States which, where properly managed, do help the general forest question in India. Map II tries to include these forests of Indian States under proper management.

26. The present forest policy gives no indication that one aim of policy should be to increase the forest area, and preferably the Government forest area, up to the minimum requirements of the country. All it says in *para.* 7 of the policy is that agriculture should not be allowed to encroach on Reserved forests sufficiently to reduce them below the minimum for the well-being of the country. It would be to the advantage of India to aim at increasing the forest area up to this minimum of 20 to 25 per cent more especially for forests falling under class (a) Protection forests. The erosion and floods caused by the bareness of much of the Himalayas is too well known to need emphasis and a far larger area should be under proper forest management, though much of it would only fall under class (d) Pasture.

27. There are three methods of increasing the forest area:

(a) bringing more Government waste lands under forest;

(b) bringing more available private area or communal land under forest by means of propaganda, help in management, etc.;

(c) by legal control of the management of private and communal forest to stop disforestation.

The Forest Act legislates for such control of private forests in Chapter V but in practice the sections are not ideal and have not been greatly used. Large areas of private forests have in fact disappeared. The Act lays down that Government should only take control for certain definite protective reasons, but does not mention the very important reason of keeping a certain percentage of forest land for the general well-being of the agricultural community. Even when lands have been taken over by Government under sections 36 and 37 they have usually only come under Government control when they had already been ruined as forests

28. Certain provinces in India, having foreseen the danger to the country at large from the mismanagement and destruction of the private forests, have already taken steps to draft legislation to control such destruction and, even if these have not become law, they are a step in the right direction. Attention is called to the following draft bills; the Chota Nagpur Private Forests Bill of 1939, the United Provinces Rural Development Bill of 1939, and the Report of the West Bengal Forest Committee containing the Bengal Private Forests Bill of 1939. It is understood that the N.-W. F. P. is also contemplating the revision of the rules for Gurzara forests under the Hazara Forest Regulation and that it is creating a special forest division for their better management.

Chapter III

EXISTING DEMANDS ON AND SUPPLIES OF FOREST RESOURCES

29. Forest produce is commonly divided into major forest produce, which consists of timber and fuel, and minor forest produce, which includes everything else obtained from forests like resin, drugs, essential oils, honey, wax, grazing, etc. For the moment I am excluding all minor forest produce except grazing and considering only timber, fuel and grazing.

30. To understand the position, the consumers of forest produce can conveniently be divided into

(a) 'General consumers', by which is meant the consumers whose wants are supplied by the timber trader and merchant. They consist largely of the urban population.

(b) 'Local village consumers', by which I mean the villagers living close to the source of supply of forest produce; and

(c) 'Ordinary village consumers' who live far distant from any source of supply of forest produce.

31. Their demands are very different. The 'general consumer', in addition to a demand for fuel, needs large timber, which is comparatively valuable and which can bear the cost of conversion and transport, for example railway sleepers. large building timber, general manufactured timber for furniture, boxes, etc. The village consumers, on the other hand, who are almost entirely agriculturists, need mostly small timber for house-building, agricultural implements, etc., and also fuel. These articles are not valuable and cannot bear any great costs of conversion and transport. Unless therefore the villagers have

access to forest produce more or less in their immediate neighbourhood, that is to say, are of class (b), local village consumers, their wants for forest produce must go unsupplied.

32 Fellings to supply war demands have undoubtedly temporarily upset the orderly plans of forest management. The policy of the Government of India for forest management is a policy of the sustained and equal or rising annual yield. The preliminary object of all forest management for those forests which are looked upon as class (b) Timber forests is to obtain what the forester calls 'normal increment per acre in the shortest possible time', that is to say, to ensure that each acre of forest is producing the maximum amount of timber of which it is capable. A deficient increment may be caused by many things among which may be mentioned an unnecessary admixture of valueless species, a general under-stocking of the forests, poor quality trees, lack of regeneration holding up fellings, excessive age leading to decreased growth, poor silvicultural treatment with congestion and thereby decreased growth, etc.

33. For the reserved forests of India, the position before the war was very favourable. To attempt to make a complete survey of the stocking of all Indian reserved forests by species would be such a costly undertaking and so much of the money would be wasted on enumerating valueless species that no Government could afford to undertake it. Therefore the estimate of stock of a given species is only made when a demand for that species has begun to arise. The provision for the revision of working plans, that is to say the document laying down the management of a forest for a period of years, automatically legislates for the enumeration, or at least the estimating, of all the stocks of species within a few years of a demand arising. The Forest Department cannot always supply information of quantities available for some new demand of a species perhaps for five or on rare occasions for even ten years. This five or ten years, long in the business life of a trader, is nothing at all in a forest rotation and the reverse process in India of enumerating *all* species would have meant an enormous expenditure, perhaps 70 or 80 years ago, on species for which even at present there is no demand at all, even though the war has given a great impetus to the demand for hitherto unused species.

34. Taking India as a whole, the forests, though not yet fully productive, were on the whole as productive as could be expected considering that the Forest Department only 80 years ago took over a depleted and often ruined forest estate. and were all tending towards full production. In certain areas, for instance, the west coast of Madras, the evergreens of Bombay, the areas of inferior species of Assam and the miscellaneous forests in other parts of India, the full productive capacity of the soil had not been attained, but even there, there was steady progress at every revision of a working plan.

35. The general working plan position was also satisfactory throughout India before the war, all the more valuable forests being covered by adequate and up-to-date working plans. Only in Bombay and Bengal was the revision of working plans seriously in arrears, while in Assam the plans were sometimes based on rather insufficient data and in Bihar plans had not always been prepared for those private forests, the management of which had only been recently taken over.

But the fellings necessary to supply the enormously increased military demand for timber have naturally meant overfelling and have necessitated the departure from the normal permissible yields from Indian forests.

36 The following table shows for timber and fuel, province by province, an average of the quantities extracted from the forests during the years 1935-36 to 1938-39 and the amounts extracted during the years 1939-40, 1940-41, 1941-42 and 1942-43. The assumption has been made that the average extraction for the years 1935-36 to 1938-39, that is to say the four years preceding the war, may be taken as the true average permissible yield of Indian forests at the moment. The year 1938-39 has been included because, up to the end of that year, war fellings had been practically negligible.

Yield of Timber & Fuel in 1939-40 to 1942-43 compared to the average yield of 1935-36 to 1938-39 (4 years)

Province.	Average of 1935-36 to 1938-39.			Yield of 1939-40.			Yield of 1940-41.			Yield of 1941-42.			Yield of 1942-43.		
	Timber Lakhs of C. ft.	Fuel Lakhs of C. ft.	Total Lakhs of C. ft.	Timber Lakhs of C. ft.	Fuel Lakhs of C. ft.	Total Lakhs of C. ft.	Timber Lakhs of C. ft.	Fuel Lakhs of C. ft.	Total Lakhs of C. ft.	Timber Lakhs of C. ft.	Fuel Lakhs of C. ft.	Total Lakhs of C. ft.	Timber Lakhs of C. ft.	Fuel Lakhs of C. ft.	Total Lakhs of C. ft.
Bengal	91	166	257	104	170½	274½	102	158	260	111	183½	294½	...	...	...
United Provinces	97	329	426	108	485½	593½	147	505½	652½	154	504	658	226½	510½	737
Punjab	57	277	334	60	280	365	107½	279	386½	...	...	...	170	246	416
Bihar & Orissa	30½	80	119½	53	80½	133½	63	81	144	...	...	...	...	...	...
Assam	60	74	143	60	76	145	91	85	176	90	82	172	79	100	179
Central Provinces	115	347	462	123	333	455	137	313	450	154	284	438	180½	236	425½
Coorg	4	2	6	5	3½	8½	5	3	8	6	3	9	5½	3	8½
N. W. F. P.	18½	17	35½	19½	17	36½	20	17½	46½	25½	19	44½	17½	19	36½
Ajmer	...	5	5	...	3	3	...	3	3	...	3½	3½	...	3½	3½
Baluchistan	...	8	8	...	10	10	...	21	21	...	...	...	...	...	...
Andamans	20	9	29	22	7	29	27	6	33	...	...	...	...	...	...
Madras	36	178½	214½	31½	181	212½	35	193	228	93	136	229	52	298	350
Bombay & Sind	69½	628	697½	66	580	646	76½	578½	655	92	628	720	135½	628	763½
Average total of all provinces for 1935-36 to 1938-39 (4 years).	616½	2120½	2737	667	2235	2902	820	2243½	3063½	...	...	...	...	...	...
Average total of 9 provinces of 1941-42.	500	1746½	2246½	...	...	...	...	...	...	663½	1903	2568½	...	...	...
Average total of 9 provinces of 1942-43.	466	1857½	2323½	...	...	...	...	...	...	...	...	...	875½	2044	2919½
Excess over the averages	...	...	...	50½	114½	165	203½	129	329½	163½	156½	322	409½	186½	596
Excess over the averages in percentages	...	...	...	8	5	6	33	6	12	33	9	14	88	10	26

37. These figures show up to the end of the financial year 1943 an excess felling of timber of 162 per cent for all India over the normal annual pre-war figure. Taken as a total this means 1½ years advance fellings and is really an infinitesimal over-draft on the forest capital of India—far less than the advance fellings of most other countries.

38. The United Provinces, the Punjab, the Central Provinces, Bombay and Sind, all very large contributors to India's total timber supply, have very largely increased their fellings in 1942-43, so that for those provinces the excess felling may already be two years in advance, and if the same is continued during 1943-44, might easily be four to five years in advance. But although the effect of excess felling must be considered according to the special features of each forest, it is possible to give some sort of general picture assuming that as much is felled in 1943-44 as was felled in 1942-43. Up to the end of 1943-44 approximately the United Provinces will have felled about nine years yield during the five years of war. Unfortunately this will have been felled on the best trees in the most accessible areas. But this nine years yield will partly have been made up by excess but still beneficial thinnings. As I have no data of these or of what their effect will be on increment, it makes it impossible to give any accurate calculation. However, it would appear that a 40 or 50 per cent reduction over the pre-war yield for a period of between five and ten years would bring the position back approximately to normal. That is about the worst to be faced. If 20 years were taken to bring the position back to normal then the reduction would be very much less and the end of 20 years would run into the period when the first crops started in the eighteen seventies will attain maturity. In Madras the fellings of teak are probably five years in advance, in Bombay in some teak areas they are as much as ten years in advance.

39. In some ways the picture is brighter than this figure would show, because quite a large amount of increased volume which has been felled has come from species which before the war were not considered valuable and which, having now proved their worth, will contribute to the perpetual wealth of Indian forests. A further bright side of this picture of overfelling is that it has enabled a large amount of material to be removed in thinnings which was formerly unsaleable and has thereby done a great deal of silvicultural good. It has necessitated sometimes felling the best poles instead of the worst, but that small evil is not nearly so great as the evil of leaving the forest entirely unthinned, as had had to be done in many areas till the war demand arose.

40. Serious though these individual over-fellings may be, and though they will cause a diminution of timber supply and revenue for a few years immediately following the war, they are not of real importance taking into consideration the normal rotations of forests in India and the enormous amount of growing stock capital. The war fellings have in no way hurt the reserved forests of India from the climatic and physical aspect. Provincial Governments may feel the loss of revenue, but if any form of sinking fund has been created, as it should have been created, to distribute the excess revenue of the war years over the lean years which are bound to follow, then no material harm will have accrued. In fact the obtaining of the ready money when needed will have been all to the good. The management of finances, however, does not directly concern a forest officer.

41. This war felling has, however, completely upset the normal course of fellings according to working plans. Most working plans have been departed from to a greater or lesser extent, and almost everywhere this will lead to problems of forest management, even where the actual fellings may have done silvicultural good, which will need the rapid revision of most working plans and in some provinces of all working plans.

(a) The general consumer

42. In normal times, that is to say, not in wartime, the outturn of timber and fuel in India from areas under the control of the Forest Department is a little under 6 million tons, of which about 1½ million tons is classed as

timber and the rest as fuel. There are no records of the outturn from private forests, but it may be guessed as perhaps 50 per cent of that from areas under the Forest Department. The following table gives the imports and exports of foreign timber for the year 1938-39.-

Statement of import and export of foreign timber for the year 1938-39

Province.	Timber imported			Timber exported		
	Teak	Other timber	Total	Teak	Other timber	Total
	cu. tons	cu. tons	cu. tons	cu. tons	cu. tons	cu. tons
Bengal	52,096	7,571	59,667	81	7	88
Orissa	2	..	2	..	..	..
Bombay	56,737	14,154	70,891	2,048	372	2,420
Sind	12,098	3,131	16,129	3	1	4
Madras	38,062	671	38,733	249	269	518
Burma	..	6	6	..	..	..
Total	159,895	25,535	185,430	2,381	649	3,030

(Extracted from information given in the Annual Statement of the Seaborne trade of British India for the Fiscal year ending 31 March 1940, Volume I. The Andamans are obviously excluded and the accuracy of the figures may, therefore, be doubted.)

The normal imports into India are only about 185,000 tons of timber with a negligible export. Taking the timber from Forest Department areas alone, imports are only about 8 per cent of the total, and if produce from private forests is included, not more than 2 per cent. Even of this 2 per cent a very large quantity consists of teak from Burma, which will ultimately be replaced by the development of teak plantations in the reserved forests of India. The figures seem of doubtful accuracy but may at least show the order of magnitude. Towns like Calcutta may import a certain quantity of timber for the manufacture of plywood boxes, but compared with the total consumption of timber, it is not very great. There is some import of softwood railway sleepers because it is cheaper to import them than to transport them from the remote Himalayan forests where the indigenous material occurs.

There is some import from province to province. For example, the Punjab imports timber from various Indian States and firewood from Sind, the North-West Frontier Province imports firewood, Madras imports a certain amount of material from Coorg and the Central Provinces, Bihar imports timber from the United Provinces and Nepal, and so on. But taking India as a whole, except for teak, the imports of timber are negligible. It can be said that under pre-war conditions Indian forests already generally supplied the wants of the general consumer.

48. It is not so certain that this will apply in future. The forests outside the control of the Forest Department are deteriorating and often actually disappearing, while at the same time the demands of the general consumer are rising. Proposals, however, will be made for the control of the forests outside the Forest Department and where possible for raising the area of timber-producing forest in those provinces where the percentage is too small. *As a whole however, on a long-term view there is no serious problem of the supply of timber for the general consumer.*

(b) *The local village consumer*

44. Here again, taking India as a whole, there is no serious problem. The demand for forest produce of those villagers living close to properly managed forests under the Forest Department are adequately supplied either free or at rates well within their capacity to pay. Satisfactory though this is, however, it is not as satisfactory as it sounds as will be obvious from the next paragraphs.

There is some exception in Sind and Assam. In Sind a very large proportion of local villagers are supplied not from Government forests but from private forests. If such forests disappear, those villagers will lack the forest produce they need, but private forestry is being encouraged in Sind and reserves are being increased. In Assam the local villager takes his wants from the enormous area (16,000 square miles) of unclassed forests. A difficulty exists in the Surma valley where there are no unclassed forests, but there the villagers are mostly supplied from reserves. *As a whole, however, it may be said that the wants for forest produce of these 'local village consumers' are adequately supplied and there is no serious problem.*

(c) *The ordinary village consumer*

45. In the Central Provinces, because of the total area of forests in the province and the general distribution of those forests throughout the province, practically all the villagers fall under the class of 'local village consumers' whose wants are fairly generally and economically supplied. To a certain extent the same applies to the Madras Province, though there are parts of Madras where the ordinary village consumers are not supplied.

46. But throughout the rest of British India there are large numbers of these ordinary village consumers whose demands for forest produce are almost wholly unsupplied or at any rate most insufficiently supplied. Large parts of the Punjab and the North-West Frontier Province, probably 90 per cent of the plains villages of the United Provinces, probably half of Bombay, all the centre and west of Bengal, and much of Bihar and the coast lands of Orissa contain populations with an almost completely unsupplied demand for forest produce. The small timber and fuel demanded by these enormous populations is of too low a value to be imported from the distant forests and to import material to these villages would cost far more in transport alone than the material is worth and far more than any of the villagers could afford to pay. Moreover, even if the produce could bear the cost of transport to these village communities, the demand would then be far more than the existing forests of India could possibly supply.

47. *Here then is the crux of the whole problem.*—As this vast population is unable to obtain its wants in small house-building timber, agricultural timber and fuel, its general standard of living is reduced and, greatest evil of all, it is forced to burn cowdung instead of fuel.

48. It has not been possible to get any figures for the quantity of cowdung burnt in India. With no figures available, however, it is quite permissible to guess, provided there is no pretence that it is anything more than an intelligent guess. The 1925 cattle census estimated the number of cattle in India at 300 million. If it is assumed that only half the cowdung is burnt, it means that India burns the cowdung of about 150 million cattle a year. I understand that the average dry weight of cowdung produced per head per day is 10 lb. or for 150 million cattle, about 250 million tons per year.

49. The above figures do not agree with certain figures recently received from the Imperial Council of Agricultural Research. They seem to give a total manure production of about 840 million tons per annum instead of about 500 million tons as given above and calculate the amount burnt as about 560 million tons as compared with 250 million tons above. My figure was admittedly a very rough calculation but at any rate appears to be on the safe side. Whichever figure is really correct matters little. The main point is that this saving of cowdung for manure is a very important matter in the agricultural economy of India.

50. Agricultural evidence shows that 10 to 15 tons of manure are required per acre every three or four years or roughly 3½ tons per acre per annum and that this roughly doubles the crop produced as compared with unmanured fields. At 3½ tons per acre per annum the 250 million tons of cowdung could adequately manure 72 million acres and, as 226 million acres are cultivated in India, that means about 30 per cent of the whole of India's cultivation.

51. Nor is this loss of production the end of the evil. As the villager continues to burn cowdung for fuel and his fields are deprived of manure, so the fertility of the soil decreases, the crops produced get less and less (and incidentally the depleted soil is more liable to erosion) and so a vicious circle of general poverty is created.

52. *The main problem of any reconstruction scheme for forests and forest policy in India in the post-war era is, however, to supply the wants for small timber and fuel for the majority of the population of India* and more especially roughly the northern two-thirds of India. If this problem could be solved, the appalling poverty which exists among the millions of the peasants in India would very largely be removed. Given his supplies of small timber and fuel in his immediate neighbourhood, the fields could be given the easiest and cheapest manure available and a generally increased prosperity would be the result. This is no exaggeration. The general prosperity of India depends largely on the prosperity of the peasants, and this in turn is very largely dependent on having fuel and small timber available in the immediate neighbourhood.

53. Mixed up with this is the question of grazing. Although the management of grazing lands is perhaps hardly the work of a forest officer, it does become his work when those grazing lands are lands falling under class (a) Protection forests. Though forests only in name, such land is more often than not the province of a Forest Department. Recognizing this fact, the fourth class made of forest land in the written policy of the Government of India was (d) Pastures. In tackling the problem of the supply of forest produce to the ordinary village consumer provision must be made for grazing. But it should be remembered that these minor forests, managed for the supply of the wants of the agriculturist, will all be short rotation forests, many of them managed under what is called the 'coppice system' or its modification, the 'coppice with standards system', the standards providing the small timber needed by the agriculturist. These fuel rotations will be probably between 10 and 15 years, or at most 20 years, and for 5 to 10 years each rotation will provide good grazing in addition to producing fuel and timber. Once these forests close up sufficiently, the grazing will cease, but that will only be for the last few years of each rotation, so that a large proportion of this total area, probably between one-third to one-half, will not only be open to grazing but, with proper management, will produce good grazing. Moreover, for most of the years when the area will provide no grazing, it will still provide a general exercise ground for the cattle. The growing of minor forests on this land will on the whole increase and not decrease the production of fodder.

Chapter IV

FLOODS, EROSION AND DESICCATION

54. So much has been written and said during recent years about floods and erosion that there seems little necessity to stress the urgency of the problem. Still, in the two consecutive days of August 20 and 21, 1948, *The Statesman* had accounts of

(a) Jumna floods affecting 30 villages, hundreds of people and thousands of cattle.

(b) Ajmer-Marwara floods with 1,500 people drowned.

(c) Damodar river floods on 45 square miles, affecting 27,000 people with a request for Rs. 90,000 for relief and Rs. 1 lakh for agricultural loans.

(d) Orissa floods affecting 400 square miles. That is only two days' record and, besides people and cattle, there are breaches of roads, dams and railways, ruin to crops and general havoc.

55. There are several forms of erosion all of which need not be particularized here. The clogging of the natural pores of the earth from sediment washed down by rain eventually interferes with seepage and percolation. The actual run-off is thus increased and the silt and pebble-laden water running over the surface acts rather like a file in rasping away more surface soil. Not only is the surface rubbed away, but tiny gullies called 'finger gullies' are formed and

a thin skin of land is eventually stripped off. At the same time, soluble chemicals and micro-organisms necessary for plant growth are lost. This is 'sheet erosion' and, though of very great importance to any country and though something which must be completely stopped by correct cropping and land management if a country is to retain its prosperity, is not always obvious to the casual observer.

56. As more surface is washed away and the gullies extend, clefts slowly appear in the top soil cutting right through to the sub-soil so that erosion then proceeds at a greater rate than before. The gullies produce excessive drainage, the level of the underground water is lowered and even a moderate drought will cause the water supply to be below the minimum necessary for real fertility. When erosion has reached this stage, it is obvious to anyone, trained or untrained. Not only have many hundreds of square miles of India been rendered completely unproductive as a result of the floods and erosion but, unless some steps are taken to check it, this sore will fester in the body of India till the whole is diseased.

57. This question of floods and erosion is intimately connected with class (a) Protection forests and also with the forests of classes (c) and (d), Minor forests and Pastures. But, as previously stated, the classes overlap. An area may be classed as Pasture but in fact should also belong to (a) Protection class, the retention of which is so important that it should override all questions of rights, etc.

58. It is correct land management which has far and away the greatest influence on the prevention of floods and erosion. Such correct land management is extremely important in agricultural fields but, important though it is, it is not within the Department of Forestry. But a very large portion of the land which controls the flood and erosion problem of India occurs in hilly country and at the headwaters of rivers. Such areas should be placed in class (a) Protection forests and treated as such. Their correct land management should transcend all other considerations. It is the mismanagement of such land which has caused a very large proportion of the difficulty and trouble from erosion and floods in India. A great many of such lands are already under the Forest Department and are in fact managed as class (b) forests, that is to say to produce timber. There is no harm in this whatever because a forest maintained to produce commercial timber does in fact fulfil the requirements of the management of a forest necessary to be retained on climatic and physical grounds. The retention of high forest cover is in fact one of the best forms of land management to prevent floods and erosion in hilly country.

59. But there are vast areas all along the Himalayas and over many other hilly parts of India where the land is bare of tree growth, is open to unlimited grazing and is very often burnt yearly. Such land management in such places is sacrificing the starving millions in the plains for the temporary benefit—and it is only temporary benefit as anyone who knows the history of the oak forests in the hills can testify—of a much smaller population in the hills. It would be preferable for the good of India, if the whole of the vast pastures in the hills were closed and the area afforested. Fortunately, this is not necessary though it may be preferable. But it is little less than criminal to allow the mismanagement of the hills to continue where felling, fire, and grazing are often more or less uncontrolled.

60. The erosion question is also often intimately connected with (c) and (d) class forests namely, Minor forests and Pastures. Here also, though classed as (c) and (d) lands, they are often in *fact* really the important (a) class of Protection forests, and, if necessary, should be retained even at the sacrifice of all other benefits. But again such drastic treatment is not usually necessary. All that is necessary is to recognize that Minor forests and Pastures may often have this protection aspect as well and must be managed accordingly.

61. Serious though the erosion and flood problem is in India, the forests under the Forest Department, whether protection or timber-producing forests

and both reserved and protected, do usually adequately control run-off and therefore erosion and floods within their actual boundaries, though the minor forests, that is to say those really managed to supply the local villager with fuel, small timber and grazing, even when they are reserved, are not always so managed as to solve the erosion and flood problem even within their own boundaries. Thus in the minor forests of the Central Provinces, in the United Provinces in certain areas with excessive grazing rights, and in Madras in the mismanaged panchayat forests, the run-off and erosion problem is not sufficiently controlled even within the forest boundaries. In Bombay the reserves are so scattered and broken, sometimes half a hill being reserved and half open, or one aspect being reserved and one aspect open, or even with only a belt of reserve along the middle of a hill, that there also erosion and floods are not always adequately controlled even within the boundaries of reserves.

62. But the trouble is that the area under the Forest Department in almost all provinces is either wrongly distributed, too small, or both, to control the main erosion and flood problem. In the Central Provinces where the forest is well distributed and adequate in quantity, there is no particularly serious erosion problem except local problems, but in every other province in India there is a very serious problem outside the usually inadequate area under the Forest Department. It is serious in the Punjab and the North-West Frontier Province (especially along the foothills of the Himalayas), in the United Provinces (especially in the ravine country between the Jumna and the Chambal), in Orissa and in Bihar (especially on the Chota-Nagpur plateau where areas of private forests have already been taken under management to improve matters and far larger areas ought to be taken under proper management), in Bengal (particularly in western Bengal—*see* the Report of the West Bengal Forest Committee of 1939), in Assam (especially in the hills where shifting cultivation is doing tremendous damage), and even in Madras, despite the rather large proportion of the total area under the Forest Department.

63. It is difficult to get any table showing a relation between the main types of land management and floods and erosion, because most investigations have dealt with some particular aspect of the problem such as comparing different soils, different gradients, grassland with bare land, forest land with grass land, different agricultural crops or different rainfalls. The following tables are compiled from data from different experiments but which are in general reasonably comparable.

64. The run-off percentage of the rain that falls on an area is as follows:

Run-off percentages (water loss in per cent of precipitation)

Country	Reference	Completely bare ground	Grass land	Well managed pasture	Forest burnt annually and litter removed	Forest with normal ground covering
America . . .	II	19%	..	3%	..	..
India . . .	III	25%	7%	..	..	..
America . . .	IV	15%	9%	3%	..	..
America . . .	V	12%	..	2·5%	2·6%	0·3%

A general average of the above figures shows that the different kinds of soil cover result in a percentage loss of the precipitation that falls in the following proportion:

Forest with normal ground cover	1
Forest burnt annually and litter removed (or heavily grazed)	3
Well-managed pasture	3
Grass land	10
Completely bare ground	25

65. The following table shows the effect of the run-off in tons of soil lost per acre per year:

Soil lost per year in tons per acre

Country	Reference	Completely bare ground	Grass land	Well-managed pastures	Forest burnt annually and litter removed, i.e. the same effect as over-grazing	Forest with normal ground covering
America	I	..	..	..	2·4	0·004
America	II	50·9	..	0·003	..	..
India	III	8·3	1·6	..	..	..
America	IV	5·1	0·2	0·0	..	..
America	V	18·0	..	0·2	0·2	0·01

A general average of these figures shows that the different kinds of cover result in a loss of soil per acre per year in the following proportion:

Forest with normal ground covering	1
Forest burnt annually and litter removed (or heavily grazed)	20%
Well managed pasture	14
Grass land	130
Completely bare ground	3,250

66. In the above two tables it is interesting to note that although forest with its normal ground cover is better than any other form of land management to prevent run-off and erosion and although forest soil burnt annually with the litter removed or heavily grazed is still quite good at preventing run-off and is as good as well-managed pasture, the removal of the litter has minimised its capacity for preventing erosion. If the forest litter is completely removed, the figure for erosion rises to about 190 so that the complete removal of litter under forest cover turns the best preventive of erosion into a poor preventive.

67. It is of interest to note that in the detailed figures given by Ayres most agricultural crops such as cotton, wheat, corn, alfalfa have a run-off and erosion comparable to and often greater than bare land.

68. It is also worth mention that it is not the average rainfall that does most damage but a single infrequent but heavy storm which by cutting out fresh gullies starts a new cycle of erosion. This occurs in many parts of India, particularly in the Punjab where the small annual rainfall usually consists of a few heavy storms. It is in fact characteristic of India that even the normal rainfall is not evenly distributed throughout the year but mostly falls in the few monsoon months. Some measurements of the effect of single storms in America in conditions similar to those of the Punjab are given below:

Rainfall		Cover	Run-off per cent of precipitation	Soil loss Tons per acre
Amount (inches)	Duration (hours)			
5	9	Bare	35%	44
5		Grass	0·4%	Nil
5		Forest	0·4%	0·1
3	10	Bare	53%	2·6
3		Grass	2·3%	0·2
3		Forest	0·3%	0·005
1·5	0·7	Bare	59%	4·1
		Grass	1·2%	0·01
3·75	9	Bare	53%	20
		Grass	39%	0·1

A general average of these figures shows the following as general proportions of the run-off and soil loss in single heavy storms for three different kinds of cover:

Cover	Run-off	Soil loss
Forest	1	1
Grass	27	32
Bare land	125	800

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69. A further question which may be dealt with here is the very dry area existing roughly to the west of a line running from Ambala *via* Etawah to Ratlam and across to Mt. Abu. Everywhere west of that line conditions are dry and, though forests will grow, they are of the tropical dry thorn type, the rainfall being below 30 in. Further west conditions get even drier. Thus, west of a line from Lahore to Rohtak and then through Ajmer to Nawanagar, the rainfall sinks to below 20 in. and the forest is more scrubby and consists of even drier and more scanty thorn forest. Forests of a sort can still be grown here perfectly well without irrigation, and species can be grown which are very useful for the small timber and fuel so necessary for the agriculturist such as *babul* (*kikar*) if there is no frost, *shisham*, *khair*, etc. Further west still, west of a line roughly from Lyallpur through Bikaner, about 50 miles west of Jodhpur and then down to a point about 100 miles south-east of Karachi, the rainfall sinks below 10 in. and, proceeding from that line westwards, the rainfall gets less and less till complete desert conditions are met. But even here, over much of the area, forests of a sort, sufficient to provide fuel and some small timber, could still be grown so long as the plants could be watered for the first two or three years. Needless to say, where proper irrigation is available, good forests could be grown over much of this area provided suitable species were chosen.

70. Over all this tract below the 30 in. rainfall line, there is possibly an even more important point involved than the mere provision of fuel and small timber. It has been stated, though I have no actual evidence, that the desert conditions are spreading eastwards and that the country over all this tract is getting drier. Whether this is correct or not at present, it is an obvious danger. Without entering upon the controversial question of forests increasing rainfall, it is an acknowledged fact that forests do conserve what rainfall there is, prevent evaporation, generally mitigate the extremes of climate and are a great adjunct to agricultural dry farming, which presumably must be practised over much of this area. Apart therefore from increasing the general fertility and improving the climate over the tract itself and preventing dust storms, the afforestation of this area would undoubtedly act as a barrier against the spread of desert conditions and preserve the fertility of the Gangetic plain to the east of the 30 in. rainfall line.

Chapter V

FOREST RESEARCH

71. Forest research is centralized at Dehra Dun, but there is nothing to prevent provincial Governments from appointing their own research officers in the provinces. Some provinces have done this but only for research in silviculture which, by its nature, must to a large extent be done in the provinces, though Dehra Dun is a central repository for results.

72. The present organization of the Forest Research Institute is that the administrative head is the President, who is a forest officer. Under him are the branches of Botany, Silviculture, Entomology, Chemistry and Minor Forest Products, and Utilisation, each with a branch officer at its head. There is in addition a Timber Development branch which is virtually, though not actually, in abeyance at present. The President has a personal assistant.

73. The Botany branch deals with identifications, ecology, etc. and has a Mycology section dealing with research into the fungal diseases both of living trees and converted timber. It has two gazetted assistants, one dealing with systematic work, and the other is the head of the Mycology section. There is also a post of Oecologist, which is vacant. The Silviculture branch, in addition to the Silviculturist as head of the branch, has a Statistical Assistant Silviculturist and an Experimental Assistant Silviculturist. It has also a General Assistant sanctioned for two years but unable to be appointed at present. Just at the moment the Statistical Assistant Silviculturist's post is also unable to be filled. The Entomology branch deals with insect pests both of the living trees and of the converted timber. It has, in addition to the Forest Entomologist, a Systematic Entomologist and two Assistant Entomologists. There are also two posts of Divisional Entomologists which are vacant and which are unlikely to be filled. The Chemistry and Minor Forest Products branch has a Bio-Chemist as head of the branch with two Assistant Chemists and an Assistant Chemist, soil section. There is also a temporary post of Rubber Chemist. Under the Bio-Chemist also is the Minor Forest Products section with a Minor Forest Products Officer and an assistant. Neither post is filled at the moment, but they are likely to be filled in the near future.

74. There are other Institute posts sanctioned, but the above really gives a truer picture than the actual sanctioned posts, because the posts have been sanctioned piecemeal, then some of them left unfilled and now are unlikely to be filled owing to changes in organization. For example, there is a permanent post of Officer in Charge, Minor Forest Products section, which is held in abeyance, its place being taken by the temporary post of Minor Forest Products Officer referred to above. There is also sanctioned a temporary post of Documentation Officer, but this will not be filled as, with the present Minor Forest Products Officer, it is now considered unnecessary. There is also a temporary post of Assistant Chemist in this section which only happens to be vacant at the moment.

75. The Utilization branch contains the sections of Timber Testing with an officer in charge and an assistant, Wood Technology with an officer in charge and a temporary assistant, Paper Pulp with an officer in charge and an assistant, Wood Seasoning with an officer in charge and two posts of assistant, one of which is vacant, Wood Preservation with an officer in charge and two temporary posts of assistant, Wood Workshop with an officer in charge and an assistant, the former being vacant at present, and an Engineering section with an officer in charge of the section.

The Entomology branch and the Mycology section of the Botany branch must naturally work in close coopération with the Wood Preservation section on the protection of converted timber.

76. The above account of the general organization has purposely omitted certain small variations which exist merely as a result of the war. For example, at the moment both in the Paper Pulp and Seasoning sections the real officer

in charge is seconded for other duty, while the assistants are carrying on the sections either in addition to their other duties or with the assistant's posts vacant.

77. The Inspector General of Forests is also the President of the Institute. There is no need here to give a detailed history of how this unhappy combination arose. It was always a combination of expediency rather than efficiency. Before 1926 there was both a President of the Institute and an Inspector General of Forests. Between 1919 and 1925 the Institute's gazetted officers increased from 11 to 27, the budget from Rs. 3½ lakhs to 8½ lakhs and the Institute estate from 40 acres to 1,000 acres. Naturally, the work and responsibility of the President rose in proportion. Yet it was in 1926 that it was decided to combine the posts of President, Forest Research Institute and Colleges and the Inspector General of Forests, on the ground that the Inspector General's direct work had decreased as a result of forests becoming a transferred subject. In fact, the Inspector General's work of advice to the Government of India and his work connected with the provinces was exactly the same in practice as it had always been, except that, as a result of provincialization, he now had to persuade where previously he could have ordered. Since that date a very large increase in his work has taken place as he is now permitted to tour and advise in Indian States with their consent in much the same way as he does in provinces. This has been taken full advantage of by the States and it is admitted, I think, that it is for the general good of the country. Correct forest management in British India to minimize the danger of floods and erosion would be largely vitiated if neighbouring Indian States managed their forests badly, for example all those Indian States along the southern catchment area of the Ganges. Thus, both the President's and the Inspector General's work has increased and not decreased.

78. There is plenty of evidence that the combination of the two posts has not led to efficiency. In 1929 the Government of India appointed the Mehta Commission to enquire into the workings of the Institute, in 1938 they sent Sir Shanti Swarup Bhatnagar to investigate and report on certain aspects of the work, in 1940 they formed a central advisory board in forest utilization and in 1941 a proposal was made that a further general enquiry committee should be appointed though, owing to the war, it did not materialize. I suggest that if things were satisfactory, it would not have been necessary continually to appoint these investigating committees. Moreover, as long ago as 1940, I pointed out that such a post-war reconstruction policy for forestry as this would have to be written and that it was time the Inspector General began to devote some attention to it. Yet in fact, having had to hold the two posts till now, I have found it impossible to devote any real attention to this extremely important problem.

79. The Inspector General is the adviser to the Government of India on all questions dealing with the administration and organization of forests and forestry throughout India. He tours in provinces and States and reports on conditions. It is a post which a man can only attain at the end of his service and, to be qualified, an Inspector General must have had an extensive experience of general forestry with high administrative experience in a province. Ideally, the post should be held for five years.

80. But the work of the President of the Forest Research Institute is completely different. While its head must certainly have had extensive experience of ordinary forest conditions and while he must be primarily the administrator and controller of the Institute work, it is a very great advantage if he is also a scientist. Moreover, the management of a research institute is so different from any ordinary post in the Forest Department, that it needs a year or two before the holder knows sufficient about the details to be really efficient in his post. Having learnt those details, the longer the incumbent holds the post within reason the better. Ideally, therefore, the President should be a much younger man than the Inspector General, capable of holding the Presidentship for at least ten years.

81. An examination of the organization of the Institute will reveal another peculiar anomaly. Four out of the five branches deal with a single science or a

series of very closely related sciences. Even the Mycology section of the Botany branch, which is very specialized work, is still botany and is work which any good botanist should be capable of understanding sufficiently to direct and generally to control. But in the Utilization branch the sections are as wide apart and as varied as the branches are in the rest of the Institute. The main qualifications in Timber Testing, for example, are mathematics and engineering, while in the Paper Pulp section the qualifications are fundamentally a very specialized form of chemistry. The result is that while the branch officer in all the other branches is a technical head and technically responsible for all the work of the branch, the Utilization Officer is not qualified in any of the sections of the branch and is just as purely an administrative officer as the President. In other words, the Utilization branch is really a small separate and independent Institute with its own centralized office, its own budget, etc. As organized at present, to be efficient the head of each section in the Utilization branch should be able to direct technically the work of the section just as in the rest of the Institute, the branch officer is technically able to do it. This peculiar organization of an Institute within an Institute naturally leads to various difficulties.

82. After several years at the Institute as a research officer and now as President, I consider emphatically that this attempt to combine the direction of the Forest Research Institute with the post of Inspector General, both of which are heavy full-time posts, has never been efficient and never will be. A Vice-President has been sanctioned at the Forest Research Institute for two years from the end of 1948 and in practice he will virtually control the Institute as a President. The experience gained will enable the final decision to be taken whether this organization should be perpetuated. If it is, the Vice-President should be made the President and the Inspector General definitely made Inspector General only, with headquarters with the Government of India like all other heads of departments.

83. As already stated, a commission to reorganize the Institute was to have come to India in 1941, but owing to the war was postponed. I recommend that such a commission be appointed immediately after the war. Someone on that commission should have intimate knowledge of the internal workings of the Institute and its relation to the forest service. He should be a member of the commission to cross-examine witnesses and not merely be a witness himself. I regret to say that in reading the Mehta Commission Report and knowing the internal arrangements of the Institute at that time, it is evident that no one on the Commission knew sufficient of the inner working of the Institute to sift the evidence enough to know where it was being influenced, possibly unconsciously, by personal considerations.

84. On the whole, there need be no great change in the general organization of the Institute. Improvement in detail is certainly possible, but the general idea of an administrative President with a detailed knowledge of forestry, forest conditions and the detailed needs of the Forest Departments in research, with certain branches under him, the head of the branch being technically responsible for the work done in it, is sound. Even though there might be some rearrangement of the branches, the existing branches of Botany, Silviculture, Entomology, and Chemistry and Minor Forest Products are suitable. There are obvious possible modifications; but these, having been in existence for a long time, have collected and arranged data and, on the whole, should not now be materially changed.

85. But the anomalous organization of the Utilization branch within the framework of the Institute must be changed. There are two obvious ways of doing this. The Utilization branch could be definitely constituted a separate technological Institute with an administrative head, its present sections becoming branches. (One of its branches would then probably be Chemistry and Minor Forest Products.) It is a branch essentially dealing with the products of forestry and not with forestry itself. It deals with the raw material for trade and would normally be better situated in a trade centre. Its head would not necessarily need to be a forest officer though on the staff there should be some experienced forest officer

to act as a liaison between this trade research and the needs and possibilities of the Forest Department itself. This form of solution has been adopted in some other countries. While I insert it here for consideration, I do not advise it. The whole work of the Utilization branch has been so intermingled with the rest of the Forest Research Institute for so many years that a separation now would, I consider, bring more evil than good.

86. The other solution, however, is to bring the organization of the Utilization branch into line with that of the rest of the Institute. This would not be difficult. One man cannot possibly be a technical expert in all the various sections of the Utilization branch as constituted at present, and this is one of the reasons he has developed into an administrative head only. The existing Utilization branch should be split up into groups of sections to form branches parallel with those elsewhere in the Institute. The head of each of these newly constituted branches would be as in the rest of the Institute, a technical officer technically responsible for the work in his branch.

87. Suggested groupings might be Mechanical Engineering, Wood Workshops, Wood Technology and Timber Testing to form one branch with an engineer as head of the branch. This engineer should, if possible, be experienced in extraction and logging problems. The post already exists in the Timber Development Officer. It may be mentioned here that there was a Forest Engineering Service for all these problems connected with sawmills, transport, logging, etc., but it died through lack of work. But while there is insufficient work for a whole forest engineering service, there are plenty of problems demanding solutions and there is plenty of room for one such officer at Dehra Dun.

88. It must also be mentioned that there is no officer at the Institute to carry the results of timber testing to its final translation into wooden structures, buildings, bridges, etc. The result is an accumulation of data with little practical result. An engineer capable of designing structures making use of the results is a necessity, and this lack has been felt repeatedly during the war and more especially when there was a need for very large wooden aeroplane hangars. Nobody had any experience of designing such a structure. If such a man were made head of this Timber Development branch, he might gain the logging and sawmilling experience; if that is not possible, then there must be two men.

89. The other three existing sections of Wood Preservation, Wood Seasoning and Paper Pulp could also be combined into a second branch with a Chemical Engineer as head of it.

90. The next step would be to combine most of the office of the existing Utilization branch with the Central Office, and also to combine the budget with that of the rest of the Institute, thus completing the general aim underlying the Mehta Commission Report of 1929 but which was only carried out for the rest of the Institute and not for the Utilization branch. The present administrative Utilization Officer would cease to exist.

Chapter VI

FOREST EDUCATION

91. The Forest education which has to be legislated for in India is:

(a) the training of Foresters;
(b) the training of Rangers; and
(c) the training of gazetted officers.

(a) *Foresters*

92. Arrangements for training Foresters are made by provinces themselves at various provincial schools for Foresters. The arrangements are satisfactory as far as they go and need not be further considered here. It might perhaps be advisable to forecast roughly the total demand for such training throughout India to assure that the total number of such schools throughout the country is adequate for the work required.

(b) *Rangers*

93. Rangers have been trained at Dehra Dun since 1878. There is no need to go into all the past history, but Dehra Dun has not always been the only school for training the Rangers. There was a school at Coimbatore in

Madras and until this year a class at Poona in Bombay. For a period from 1933 to 1935 the Indian Forest Ranger College at Dehra Dun closed down owing to a temporary lack of demand for training; it was then revived principally for training the Rangers from the United Provinces and the Punjab and from 1937 has existed in its present form for training the Rangers from all provinces in India and from Indian States. Actually Madras first sent Rangers for this training at Dehra Dun only in 1943 and Bombay has not yet sent any, though it proposes to do so from the class beginning 1944. This is most welcome as it is the opinion of the vast majority of forest officers, if not of all of them, that by training the Rangers together at one centre for the whole of India, including the Indian States, a certain service tradition and *esprit de corps* is engendered which can be attained in no other way. The course is a two-year course, a new class arriving each year.

94. There has been a most gratifying increase in the interest in proper forest management by the Indian States in the last few years. I have already stressed how much the general welfare of India depends on proper forest management in the States and every effort is being made to encourage this and to give them every help possible. The forecasted demand for seats in the Rangers' College for the next five years is an average total of about 55 students of which the demand is 30 from provinces and 25 from States. The total capacity of the existing Indian Forest Ranger College in Dehra Dun is a yearly intake of 39 students, making a total in residence at any one time of 78 students. This is the utmost possible for the college to accommodate and a class of 39 students is too large for maximum teaching efficiency. If this demand of 55 students per year were the normal perpetual demand to replace wastage, then the question of expansion of the college would arise. Actually, however, the total cadre of Rangers for the whole of India is approximately 800 with a probable expansion in the near future to approximately 900. In most provinces a percentage of recruitment is made by promotion from the lower ranks of the service and, assuming that roughly one-third of the Rangers' posts are filled in this way, it means that the total directly recruited cadre is at present about 530 and may easily expand to 600. Again, assuming that the average service of each Ranger who enters the service, including casualties of all sorts, is 25 years, it means the average annual recruitment must be for provinces from 21 to about 24 per year. With the maximum possible accommodation of 39 students per year, this leaves from about 15 to 18 as the absolute maximum possible for Indian States. Although I have no figures for the States, it does appear that it would be unwise at present to embark on any scheme for expanding the size of the Indian Forest Ranger College.

95. There is, however, one change which should be made. It is most inconvenient for administration to have the Ranger College situated five miles away from the present New Forest: quite apart from the fact that the New Forest is very much more favourably situated for the teaching of forestry, for which in fact the estate was partly acquired. The advent of the 17th British General Hospital has necessitated certain rearrangements of the Institute and in particular the closing down of all the museums and a rearrangement of the Utilization branch, so that the latter is now almost wholly situated outside the main building over at the workshops. The museums must of course be reopened directly the 17th British General Hospital leaves, but there is no need for the Utilization branch to return to the main building, in fact the present arrangement is undoubtedly more efficient, despite certain minor inconveniences. I have examined the accommodation carefully and I am convinced that the whole of the two Rangers classes could be provided with adequate lecture rooms, laboratories, etc., in the existing Forest Research Institute building at the New Forest, as soon as the 17th British General Hospital leaves it. Such a move would of course not provide for living accommodation either for the Rangers or for the Instructors. The move would necessitate the building of hostels to accommodate some 80 students, two more bungalows of the type to accommodate Class II officers, and two more bungalows of the Class I type. What this will cost in the immediate post-war era I am unable to say, but it is quite certain that the

disposal of the existing very valuable Indian Forest Ranger College and estate would fetch far more than any cost involved. Whether it would be wise immediately to dispose of the older building is another matter. I would advise that it be retained for a short period in case the very excessive demand for Rangers' seats in the immediate future, with the possibility of a much larger cadre after the post-war reconstruction, necessitates an extra class for a few years before the figures have settled down to the normal annual recruitment.

(c) *Gazetted Officers Class*

96. A detailed history of this class is unnecessary. Briefly, however, the old Imperial Forest Service was trained at various institutions in Europe up to 1930 with an increasing percentage trained in the Indian Forest Service class at Dehra Dun from 1920. This class ended in 1932 when the last recruits to the old Imperial Forest Service entered the service. The old-style Provincial Services were recruited in various ways, but up to 1912 it was always by promotion from the Ranger service with or without extra training. From 1912 it was recruited directly from a class trained at Dehra Dun. This class for training the direct recruits to the old Provincial Services lasted in Dehra Dun up to 1928.

97. With the provincialization of the forest services in 1937, the question of training the future gazetted officers for these new provincial services again arose. The existing Indian Forest College for training the gazetted officers class was started at Dehra Dun in 1938 and housed at the Forest Research Institute. The maximum accommodation for this class is 32 in the laboratories, lecture rooms, etc., but at present only 30 can be taken, and that with some difficulty for living accommodation, etc. The living accommodation has been obtained by taking over and adapting certain Class II officers' bungalows.

98. I have no exact figures for the average annual demand for recruits to the gazetted services, but it would appear that it is about 20 to 24, including the present demand from Indian States.

99. The present arrangements for this education of gazetted officers are adequate as far as they go except that proper hostels for these students should be erected after the war and the Class II officers' bungalows, which have been taken over, reverted to their proper use.

100. One suggestion, however, is recommended for the future education of these gazetted officers. In Circular No. 4-F., dated February 13, 1902, the Government of India enunciated rules for special continental tours for members of the Indian Forest Service when on leave in order to keep them up to date in the various problems of forestry and to encourage professional efficiency. There is no doubt that these young gazetted officers trained at Dehra Dun would benefit at least as much by such tours as the former members of the old Imperial Forest Service. I recommend that it be made a normal and not an exceptional thing that either a selected member or preferably every gazetted officer who passes from the Dehra Dun class should make such a tour in Europe within the first five years of his service but after he has left Dehra Dun and has had some experience of actual forestry and forest conditions in India. Dehra Dun trained forest officers in fairly recent years have actually been sent to Europe in this way by the United Provinces Government. There is no need to go into details of the exact rules which should be made to govern such tours, or whether it should be for every student or only for a percentage, though personally I consider it would be advantageous if every student made such a tour. It need not, however, be longer than six to eight months and facilities already exist to arrange the continental tours and to provide the necessary instruction. I have already worked out the total expenses of such a tour, including fees to the University, living expenses, touring expenses on the continent, living on tour, etc., and it would come to between Rs. 4,000 and 4,300 per student, exclusive of passages from India to Europe. It would not necessarily cost Government that amount extra because the officer would be paid his ordinary salary and it should only cost Government the difference between his normal living expenditure in India

and the above total. I may add that both the Director of the Indian Forest Ranger College, and the Principal of the Indian Forest College agree that such a tour early in a man's service would greatly increase the general level of efficiency of officers. All the students and recent ex-students whom I have been able to consult also believe it would be of the greatest advantage to them professionally.

Chapter VII

CREATION OF A FEDERAL FOREST SERVICE

101. The Hon'ble Member, Sir Jogendra Singh, has more than once suggested the possibility of creating a Federal Forest Service to fill posts under the central Government and possibly interchangeable with men from the provinces. So far as the Forest Research Institute itself is concerned, it is an undoubted fact that greater efficiency would be attained if every gazetted officer were also a forest officer, but of course much of the work is so specialized that it would be quite impossible ever to fill the posts with forest officers. There are, however, certain posts which can be and in fact are filled by forest officers who are also specialists in some particular science more or less directly connected with forestry. There is no doubt that more posts could be so filled, for example, certain posts in the Botany branch, in the Entomology branch, in the Minor Forest Products section of the Chemistry and Minor Forest Products branch, and of course, by its nature, all the gazetted officers in the Silviculture branch. In addition, of course all the instructors at both colleges dealing with forestry subjects must be forest officers.

102. At present these officers are seconded from the provinces. During the war it has been increasingly difficult to fill posts, and in fact posts have had to be left vacant because they could not be filled, and various expedients have been adopted to fill others. It is true that to a large extent this difficulty would disappear after the war; but the war has certainly shown that when the forest staff in provinces is properly occupied, the needs of Dehra Dun have perforce to take second place, and this decision rests with an officer who usually knows little or nothing of the aim or utility of a large proportion of the Institute work

103. This is an argument for a Federal Forest Service to staff such appointments at Dehra Dun. But there are in addition certain other forest posts directly under the central Government, for example, the officers in the Andaman Islands, Coorg, etc.

104. Nor is the above the whole scope for a separate federal service under the Government of India. There is an increasing demand for forest officers in Indian States and these not entirely as the ordinary State Forest Officer. Demands arise for seconded officers to make working plans or to advise on general possibilities, etc. If such a federal service existed and officers could be lent to individual States or to Agencies as advisers, in much the same way as there is a Forest Adviser to the Eastern States Agency, there would be a demand for their services, and it would be for the general good of forestry in India. I am not making any further detailed suggestions, but it is a matter which might be seriously considered with the Political Department

105. I have enquired from all parts of the empire about this in places where there are separate States rather on the analogy of Indian provinces and a central Government. I have only had replies from Australia, South Africa and New Zealand. Australia has a Federal Service separate from the Provincial Services. South Africa has a Federal Service only and no provincial services. New Zealand the same but has no separate provinces in the Dominion. I also know that America and Canada have Federal Services separate from the Provincial Services.

Chapter VIII

MINOR FOREST PRODUCTS

106 The development of minor forest products industries has been neglected in the past. They often have been collected by petty contractors in a

haphazard way and markets have been lost through dirty or adulterated material having been supplied. With such products the importance of proper grading and cleaning and the guarantee of the purity of the article need not be emphasized. The whole of this work is now under the Chemistry and Minor Forest Products branch and a proper Minor Forest Products Officer is about to be appointed at the Forest Research Institute. A great deal of information on these minor forest products has been collected at the Forest Research Institute over a number of years and it is now being compiled in such a way as to show exactly what is known and, perhaps equally important, exactly what is not known and has to be found out.

107. These minor forest products are very definitely of two types. There are those derived from more or less mature trees like, for instance, kapok from the *semul* tree, *kutch* and *katha* from the *Acacia catechu* tree, Myrabolams from the more or less mature *Terminalias*, etc., and other products derived from annual and perennial herbs like pyrethrum, ephedrine, santonin, *bhabar* grass for paper, etc., or from young trees, for example quinine from cinchona bark giving a yield at the age of about seven years, rubber from *Hevea* giving a yield at the age of about five years, etc.

108. The first type will usually remain as forest industries and part of the Forest Department work because few private individuals or communities are prepared to grow crops which give no material yield for long periods like 30 and 40 years. These have always been collected from the scattered trees in a forest and even if grown as crops by the Forest Department will probably be only so grown when they can also yield a useful timber or fuel.

109. But the second type which give their yield in a comparatively short time are probably better not collected from the scattered trees of a forest Their return is quick enough and their profit is good enough to make it worth while growing them as a special crop to yield their particular product, just as there are rubber plantations, cinchona plantations, tea plantations, pyrethrum plantations, etc. This type of crop offers scope for the ordinary individual cultivator and, once the preliminary stages are over, is probably better grown by them than by any Forest Department." At that stage they pass to the Agricultural Department.

Part II.—Suggestions

Introduction

110. It was stated in the introduction that this reconstruction policy was for British India and had not dealt with Indian States but that much of what was written applied *mutatis mutandis* to the States. This is equally true of these suggestions. There are large States, like Kashmir, which have a completely organized forest service, but there are others where there is no forest officer and sometimes no forest, or sometimes a State can only afford a forest officer of the status of a Ranger. In the Eastern States Agency a number of States have combined to employ one properly qualified forest officer to advise most of the States of the agency. I also recently recommended such a possible combination for the Punjab Hill States and I would recommend that an extension of this arrangement be examined by the Political Department who can call upon the Inspector General for advice whenever they wish. It seems to me that it would be to the advantage of the smaller States if they combined to employ a joint cadre of forest officers with a properly qualified adviser at their head. This combination might possibly be by existing agencies. In this way skilled professional advice would be available at a comparatively small cost to each State. Moreover, the smaller States could get men with better qualifications for their State Forest Officer at a lower rate provided the officers knew that there were prospects of advancement to the highest posts of a joint cadre covering a number of States.

General

111. The general line of these suggestions for a post-war plan for forestry will be evident from what has been written in Part I. For the sake of completeness any suggestions already made will be repeated in this Part II. It will be arranged under the same chapter headings as Part I, so that, so far as possible, the parts referring to the same subject can be read complete. There is unfortunately a certain amount of overlap which cannot be avoided.

112. The order in which the chapters have been written is a logical order, so far as possible, and not necessarily in the order of the importance of the problem. It is therefore repeated and emphasized here that the most important post-war forest problems of India are:

(a) Proper land management to control floods, erosion and the afforestation of the dry belt in the west: Connected with this is the defining of those areas where correct land management is necessary for the physical well-being of the country. This may affect private ownership.

(b) Second only to the above is the provision of small timber and fuel for the ordinary agricultural village consumer in India both to provide for his direct wants and at the same time to release cowdung for manure. Connected with this is the provision of an adequate total area of forest land and its correct distribution throughout India.

113. A small reconstruction forest policy committee should be set up in each province to draw up their own programme. When drawn up, the heads of these committees should meet together so that the reconstruction plans which coincide for each province (as many must necessarily do) can be discussed and as far as possible brought into an exactly similar plan for each province.

Chapters II and III: Government in relation to forestry and existing forest policy

114. The principles which govern the existing forest policy of India should be endorsed.

These are:

(a) The areas necessary for the preservation of the general climatic and physical conditions of the country must be kept as forest.

(b) The minimum amount of forest necessary for the general well-being of the country must be preserved or created.

Subject to (a), (b) above.

(c) Cultivation is more important than forests.

(d) The satisfaction of the wants of the local population free or at non-competitive rates is more important than revenue.

(e) After the above have been satisfied, the object of management is the realization of the greatest possible revenue consistent with the principles of forest management, that is to say, on the principle of sustained annual yield.

115. It should, however, be pointed out that the existing policy does not legislate for any allocation of the land area necessary to fulfil (a) above, nor does it lay down any percentage either for India or for any province to fulfil condition (b) above. These omissions might be rectified.

116. The land in each province necessary for the preservation or improvement of the general climatic and physical conditions should be classified, allotted to class (a) of the existing forest policy classification, and placed under proper land management. The majority of it will be under some form of forest management. It should be allotted to this class (a) even though it may also be allotted to and managed as classes (b), (c) or (d). Such an allotment is not difficult for areas already under the Forest Department and should be possible through the revenue authorities for other lands. After all an approximation only is sufficient to start with.

117. It is suggested that it be laid down as a general aim that the area of properly managed forest land for India should be between 20 and 25 per cent. and so far as possible this minimum should be attained in each province and equally distributed throughout the province. This point will be referred to later.

Control of private forests

118. A definite Private Forest Act should be drafted supplementing the present Indian Forest Act which is insufficient to prevent the devastation of forests even when they fall under class (a) Protection forests, and, though the Indian Forest Act does legislate for this in Chapter V, in practice the harm has often been done before control is undertaken. I am not inserting such a draft act here but it should legislate for all stages of control up to the actual taking over of the area by Government and its correct management as forest on behalf of the owner, depending on local conditions. Forest preservation might be necessary on climatic or physical grounds, or to attain the prescribed minimum of forest area in a province, or for the better distribution of forest land throughout the province, etc. Provision must also be made for actual land acquisition as it is possible that the proper management of the land, necessary in the general interest may be a definite loss to the individual owner and therefore a necessary charge on the general revenues.

Chapter III : Existing demands on and supply of forest resources

Management of existing reserved forests

119. Except to restore the departure from normal caused by the advance fellings to supply war demands, there is really very little to suggest for the management of the existing reserved forests of India under the Forest Department. Such matters as the growing of general utility species of light hardwoods to replace useless species in miscellaneous forests are fully recognized and are being legislated for in working plans. Nor has the time yet come when any coordinated plan of regeneration between provinces is necessary. At the present moment what is necessary is what is being done, that is to say, to grow such utility species wherever the soil is suitable and not already growing more valuable timber. These are in fact merely the general principles of forest management, namely to grow those species most suited to the locality and which are in general demand, on the principles of the sustained yield and with the object of attaining a normal increment in the shortest possible time. These are the principles which have actuated the Indian Forest Department ever since its inception in 1865. Though considerable steps have been made towards the ideal of a normal forest, it has not yet been attained in India, nor, for that

matter, anywhere else in the world, and probably never will be attained. But it is the forester's aim, and progress towards it continues.

120. But, as indicated in Part I, Chapter III, over-felling though not excessive as a total, has been sufficiently concentrated to upset existing plans of management. The working plan position should be examined immediately after the war and steps taken to rectify over-felling. The amount of work necessary for this will vary in different provinces. In some, fresh working plans can be made immediately, whereas in others it may be necessary for various reasons to start with rough working schemes to be converted into proper working plans at leisure.

121. The United Provinces has a special working plans circle for the making and revision of working plans and their control which, it is now generally admitted, has been in every way to the advantage of the forest management of that province. This organization is commended to other provincial Governments, as a permanency where sufficient work exists, but anyway as a temporary measure till the necessary post-war revision of working plans is complete. Some provinces are too small to make it worth while having a special working plans circle, but even those might examine the possibility of combining with a neighbouring province. The absolute minimum number of working plans to make such a circle worth while is ten plans revised on a ten-year cycle, which is a short cycle except for fairly intensively managed forest. Even if the making of each plan took two years, this would only mean one preliminary report and the control of two plans each year, which is very little. But with 15 working plans such a circle is well worth while as some of them are bound to be on a ten-year cycle and the more plans there are over that number, the more worth while does such a circle become.

122. One other point connected with war fellings which arises is the disposal of the Defence Department's stocks of timber after the war. The Board of Forestry in October 1942 has already passed a resolution on this matter and the relevant part is repeated here.

'(a) The release of Defence Department stocks after the war must be controlled by a disposal board or some such agency, and the Board of Forestry emphasizes that the Forest Department must be adequately represented in any planning for such disposal.

(b) The Board of Forestry further advises that, in consultation with railways, steps should be taken to stabilize sleeper prices after the war.'

Ordinary agricultural village consumers

123. The importance of the provision of timber and fuel for the ordinary village consumer cannot be overemphasized. Map I shows the areas of Reserved forests under the Forest Department. It is certain that these will soon be the only areas of forest left in British India under existing conditions. It shows clearly the large areas which will be left with no forest anywhere near them. To make the picture complete it should include such forests in Indian States also. In Map II an attempt is made to include these. So far as it has been possible to obtain the data this map shows in black all forests both in British India and Indian States under proper forest management, that is to say, which will remain as forest. It will be seen that, although the position is better than that shown in Map I, it still leaves enormous areas devoid of forest where the wants of the ordinary agricultural villager will eventually remain entirely or almost entirely unfulfilled.

The question therefore immediately arises whether land is available which is either covered with forest of a sort, though not under the Forest Department and not properly managed.

124. The following table compiled from *Agricultural Statistics of India*, 1937-38, Vol. 1, page 4, shows a classification of the land in the various provinces as cultivated, uncultivated and forest.

Area cultivated and uncultivated in 1937-38 in provinces and States (as far as available)*

Province	Area	Cultivated		Uncultivated		Forests
		Net area actually sown	Current fallows	Cultivable waste other than fallow	Not available for cultivation	
	Sq. miles.	Sq. miles.	Sq. miles.	Sq. miles.	Sq. miles.	Sq. miles.
Ajmer-Merwara	2,700	527	273	411	1,405	151
Assam	55,446	9,337	2,503	29,403	7,163	6,490
Bengal	70,966	38,038	7,318	8,900	15,015	7,005
Bihar	69,242	30,193	10,885	8,006	9,836	10,322
Bombay	70,128	44,868	7,906	1,388	8,942	13,025
C. P. & Berar	88,581	38,340	6,940	21,803	7,055	24,777
Coorg	1,581	220	257	18	502	518
Delhi	570	334	17	102	123	..
Madras	124,602	50,051	14,700	10,405	22,810	20,501
N. W. F. P.	13,403	3,205	900	4,436	4,199	552
Orissa	32,105	10,074	2,714	5,580	9,705	4,122
Punjab	93,992	42,051	5,775	22,133	20,847	3,086
Sind	47,156	8,032	7,016	9,318	21,170	1,121
U. P.	106,180	50,517	4,122	15,008	15,460	14,402
Total Provinces	798,911	333,583	70,996	143,701	144,370	106,253
Total Indian States (as far as available)	231,000	100,748	20,945	30,153	43,373	29,880
Grand Total (as far as available)	1,030,010	440,330	91,941	173,854	187,752	136,133

*(From *Agricultural Statistics of India*, 1937-38, Vol. I, page 4)

N.B.—These figures do not coincide entirely with those in the table under para. 16. The difference is accounted for partly by the omission from this table of the Andamans and Baluchistan and the rest because the 20,000 odd square miles of forest not under the Forest Department included in para. 16 has probably been put under 'uncultivated'. But the difference is immaterial for this analysis.

It is impossible to vouch for the accuracy of the figures, but at least they do give an indication of possibilities. It has also been possible to give in this particular table a figure for Indian States. No attempt is made to analyse these figures province by province: each province can do that for itself. But what is of interest is the total. The figures of this table (as explained in the footnote) differ somewhat from those in para. 16. It will be seen that 106,000 square miles of land classified as forest represents something over 13 per cent. of the total area of British India. At the same time, however, it classifies 144,000 square miles as 'cultivable waste' and another 144,000 square miles as 'not available for cultivation.' The probabilities are that a percentage of this 144,000 square miles classified as not available for cultivation will in fact grow forest sufficiently good for the purpose in view, namely to provide timber and fuel for the ordinary agricultural village consumer. But at any rate here is a possible 288,000 square miles from which it is probably only necessary to find between 50,000 to 100,000 square miles to solve the whole problem.

125. Connected with this a reference is invited to Map III. The map was compiled for the census and I have no information as to how they defined what they have called 'areas of forest or dense scrub' (the black areas on the map) or how they defined 'areas of small trees and open scrub' (cross-hatched on the map). It can be compared with Map II, which is the areas under the Forest Department and properly managed Indian State forest, and it will be seen that the black areas on the two maps are not entirely inconsistent. Map III also includes private forests most of which are rapidly disappearing. At any rate, even on Map III, for what it is worth, the black areas still leave enormous areas of India where the ordinary village agricultural consumer cannot possibly be supplied with his demand for timber and fuel. But the cross-hatched areas, which are only areas of small trees and open scrub, are still forest of a sort, and they do show a far better distribution over India. There are still large

areas where apparently not even scrub forest exists, but if these areas of scrub forest were taken over by the Forest Department and properly managed, it would go a long way towards solving this very difficult problem of providing forest produce in close proximity to the ordinary village agriculturist

126. An examination of Map III still shows a large blank area extending from Bengal through Bihar and the United Provinces to the Punjab and down through Rajputana, parts of Bombay and Hyderabad. But even in those areas *there are large possibilities of improvement. A reference to the table in para.* 124 will show that Bengal has apparently 9,000 square miles classified as 'cultivable waste' and 15,000 square miles as 'not available for cultivation' compared with the forest area of only 7,000 square miles; Bihar has 8,000 square miles of 'cultivable waste' and nearly 10,000 square miles 'not available for cultivation' compared with 10,000 square miles classified as forest; the United Provinces has over 15,000 square miles of 'cultivable waste' and another 15,000 square miles 'not available for cultivation' compared with 15,000 square miles of forest; the Punjab has 22,000 square miles of 'cultivable waste' and 20,000 square miles 'not available for cultivation' compared with 3,000 square miles of forest; the North-West Frontier Province has 4,500 square miles of 'cultivable waste' and 4,000 square miles 'not available for cultivation' as against 570 square miles of forest. Bombay on these figures does not appear so well off, having only 1,400 square miles of 'cultivable waste' and nearly 9,000 square miles 'not available for cultivation' compared with an existing 13,000 square miles of forest. Even therefore in these provinces where the problem of supplying the agricultural village consumer with his timber and fuel is the most acute, there do seem to be great possibilities of increasing the area under forests to supply these particular wants, and for that area to be properly distributed throughout the province so that every agricultural village has its neighbouring minor forest instead of as at present the forests generally consisting of a narrow strip along the Himalayas.

127. Moreover, in these same provinces in Bengal there are possibilities of properly managing the remaining private forests (see the report of the West *Bengal Committee), in the* United Provinces there are opportunities for the control and proper management of private forests, of mango groves, etc. (said to amount to nearly 1,100 square miles or nearly 8 per cent. of the total area of Government forests of the province), of better utilization of canal banks, roadside and railway lands and the utilization of village waste, etc. The mango groves in the United Provinces are numerous enough that, journeying in a train through the most treeless parts of the Gangetic plain, the scattered groves so quickly coalesce that they form to the eye an apparently continuous horizon of trees at a distance of not more than three or four miles. Yet a closer examination of these same groves usually shows an ill-shapen, badly managed crop producing nothing except possibly a few unpalatable mangoes. The proper management of these mango groves alone under short rotations would help very considerably towards the solution of the problem The United Provinces Government actually sanctioned a scheme for the afforestation of village land and formed a Forest Development division in 1938 to arrange plantations of agricultural timber, fuel and fodder trees in the villagers' holdings or on zemindars' land. The forest staff carry out propaganda, arrange the areas to be afforested, give technical advice and supply seeds and plants free, the work itself being done by the villagers or zemindars. It has already extended to 12 out of the 18 districts in the province and up to the end of 1942 something like 8,700 acres had been successful. It was originally intended to form a unit or division every two or three years eventually with four or five divisions covering all the districts in the plains; but naturally the war has held up the expansion, though it will undoubtedly recommence as soon as the war is over. It has been estimated, admittedly on not very reliable data, that a total new forest area of approximately 10,000 *square miles could be created in this way in the plains districts of the* United Provinces, where this problem of small timber and fuel for the agriculturist is very acute with the consequent waste of cowdung manure. Four or

five Forest Development divisions could easily be formed in the United Provinces as part of the Forest Department under a separate Conservator. This would form a circle somewhat analogous to the Soil Conservation circle of the Punjab, for it must not be forgotten that the solution of this problem of providing small agricultural timber and fuel for the ordinary village consumer by forests properly distributed throughout the provinces would go a long way towards solving the erosion problem as well. In Bihar, there are probably 3,000 square miles capable of being used for this particular supply and some 7,500 square miles of private forests which, if properly managed, would help consider bly. In the Punjab the Rawalpindi *guzaras*, which have apparently been badly managed and have largely disappeared, could presumably again be taken up by the Forest Department and could grow forest. A policy for the development of village forest is being inaugurated in Kangra, Hoshiarpur and Ambala and of course the Soil Conservation circle is dealing with waste lands so far as its staff and funds permit. In Bombay, there are about 2,000 square miles under the Revenue Department and there are about 4,000 square miles of what is called 'unassessed uncultivable land' which could definitely come under some form of forest management to help in solving this pressing problem of supplying the timber and fuel wants of the agricultural villager.

128. There seems therefore plenty of scope both for increasing the area under forest to bring it up to something approaching the figure of 20 to 25 per cent of each province and for it to be properly distributed throughout the province so that what I have called the 'ordinary village consumer', at present inadequately supplied with agricultural timber and fuel, could become what I have called a 'local village consumer' with his forest needs supplied on his doorstep.

129. In each province a classification of land should be made on the lines of that given in para. 124, but the uncultivated land should be classified in more detail and should be done from the forest crop point of view rather than from that of the agricultural crop. In this way the figures in cols. 5 and 6 of that statement would change to 'waste other than fallow on which minor forests could be grown' and 'land not available for forest cultivation.' The land given under the heading 'waste other than fallow on which minor forests could be grown' should be divided under certain heads such as private forests, village waste, groves, etc., while that given as 'land not available for forest cultivation' should also be classified as roads, buildings, water, barren lands (ravines, *usar*, sand dunes, rocks, etc.). This classification is wanted immediately as a basis for all this planning. It need not be particularly accurate to start with, nor need it have a special agency to collect it. The agency which collected the figures given in para. 124 either has the data already or could very easily collect the small amount of extra data to give the more detailed classification from the forest point of view indicated above. It would then be necessary for forest officers to check up the places classified as 'waste on which minor forests could be grown' and, only where this was insufficient and badly distributed, would they need to examine any of the land classified as barren to see in fact if any of it could grow trees. It is true that those who are used to deal with agricultural crops do classify land as barren which could often perfectly well grow trees fit for this particular type of supply. It should not be forgotten, however, that in most places the final answer will not be large blocks of forest but comparatively small areas scattered throughout the country and this is exactly what is needed.

130. I have not yet mentioned the question of grazing. The cattle problem of India is not the province of the Forest Department; but it is so mixed up with forest work that it must be mentioned. One of the chief reasons for the destruction of forests over large portions of India and the prevention of reafforestation and regeneration is the excessive grazing which takes place over such large areas. If the schemes outlined above are to succeed, grazing must be prevented while the tree crops are being established. In fact, if the areas are protected from grazing, they will give a far greater weight of grass in a few-

years than they ever produced while being continually grazed (one experiment on *usar* land in the United Provinces increased the dry hay production from 2¼ maunds per annum under continuous grazing to about 17 maunds per annum under proper regulation). Moreover, as already indicated in Part I, the areas can be opened to grazing after three or four years when the tree crops are safe and will then provide good grazing till the forest has closed sufficiently to prevent the growth of grass. The forests would still then provide good exercise grounds for the cattle till the forest was again felled and regenerated. But the rotations to supply this particular type of demand for the agricultural villager would be short and would probably vary from between 15 to 20 years.

131. For convenience the Government of India classifies its fourth type of forest land as (d) Pastures, and there is no doubt that, under this scheme, a large quantity of the uncultivable land which would come under the Forest Department would be of this class (d) Pastures. It has been estimated that such barren lands, including ravines, *usar*, etc. total in the United Provinces something like 14,000 square miles, though my own opinion is that a certain amount of this would in fact grow trees. Grazing on this area is at present unlimited and uncontrolled and the number of cattle is far in excess of what the land can stand. The grazing is poor in the rains and there is practically no grazing for the rest of the year, so that there is constant and increasing deterioration often coupled with erosion. If the country is to become prosperous, this grazing must be reduced in intensity and controlled, so that the better types of fodder grasses have a chance of increasing. Obviously, this part of the programme must be a slow process as it depends so largely on persuading the villager that it is really for his own good to keep fewer and better cattle.

132. This is really the first proposal made which means spending any considerable sum of money. I am entirely unable to give any figure for the cost of creating and managing these Minor forests properly distributed throughout the country. Fairly obviously any figure must depend on the speed with which the work is done and, as it is quite impracticable to do it all in one year, a total figure, even if it were available, would be of little use. As a very rough guide, however, I may quote the cost of the Soil Conservation circle in the Punjab. The total cost of the circle is about Rs. 5½ lakhs per year. Roughly, a lakh and a half of it is spent on conservancy and works, while four lakhs are spent on establishment, travelling allowances, etc. Naturally, in work such as this, establishment forms a disproportionate amount of the total expenditure. The establishment consists of a Conservator in charge, 11 gazetted officers, 19 Forest Rangers, 52 Deputy Rangers and Foresters and 370 Forest Guards, etc. If every province appointed a similar staff, a very considerable amount of work could be done. There would be great difficulty in finding the necessary staff to do this immediately after the war, and for some years the maximum that any province could provide, even assuming they started training and recruitment immediately, might perhaps be double the above amount. A rough figure therefore might be put as between Rs. 5 and 10 lakhs per year, which in fact is a very small amount to pay for such infinite good, when it is remembered that the destructive process of war has been spending Rs. 150 lakhs a day or 15 to 30 times as much in one day as this will cost in a year.

Chapter IV: Floods, erosion and desiccation

133. To a large extent the proposals already made will have automatically done what is necessary for erosion, floods and desiccation. It has already been recommended in para. 116 that where proper forest management is necessary to protect the climatic and physical conditions of the country, land should be allotted to class (a) forests whether it is also allotted to classes (b), (c) or (d) or not. The whole of the land of India outside the Government forests should be classified in the same way. This again, however, need not be meticulously accurate, and can probably be done comparatively quickly and accurately enough through whatever existing organization compiled the figures given in para. 124, and who will compile those for class (a) forests above. Once this

preliminary classification is made, or concurrently with it, the present land management of the areas must be recorded as whether suitable for the prevention of erosion or not. If it is not suitable, it must be altered to become suitable. A reference to para. 64 will show that forest land with normal ground covering is probably the best land management to prevent erosion and floods, while well-managed pastures is good. Grass land is moderately good to prevent run-off but is distinctly bad for the prevention of erosion. The classification of the land necessary for the protection of these climatic and physical conditions of a country will probably show that a large proportion of the land will be either forest, pasture, grass land or bare land, and it is probable that all such land would be better under the management of the Forest Department. A very large proportion of it will of course coincide with the land to be managed under paras. 123 to 129 above for the production of Minor forests, and a great deal of the rest will fall under the portion mentioned in paras. 130 to 132 above where grazing must be controlled not only for the sake of the grazing but also for the sake of this erosion. Where, however, such land falls under agricultural crops, it is not for me to suggest a solution. Without doubt, however, the answer to a very large proportion of this problem in India is (a) afforestation where possible, and (b) proper control of grazing where afforestation is impossible. Proper control of grazing will make afforestation unnecessary over large areas where control alone will allow nature to re-establish forest.

184. I also mentioned in paras. 69 and 70 that desiccation was probably advancing eastwards from the dry areas west of Etawah where the rainfall is always below 30 in. and falls as low as 4 or 5 in. The creation of Minor forests indicated under paras. 123 to 129 above to supply the wants of the general agricultural villager will, to a large extent, automatically solve this problem also if the total possible area is taken up and afforested (please see the cross-hatched areas of Map III). A large portion of this area falls within the boundaries of Indian States and the solution of much of the problem will therefore depend on them, though presumably the central Government will give all the help it can. Below a rainfall of about 15 in. it will be difficult or impossible to start most species of trees without irrigation, though some of the very dry species could be started without irrigation down to a rainfall as low as 10 in. to 15 in. Below that figure trees cannot be started without irrigation in their early years, and the solution of that problem depends therefore on the solution of the irrigation problem.

185. I have repeatedly recommended, and it has been accepted in principle, that an officer or officers should be appointed at the centre to deal with the whole of this question of floods, erosion and desiccation. I repeat that recommendation here. In addition, however, an officer or officers inside each province are also necessary. It has been suggested that this should form a separate Soil Conservation service. I do not agree with that view myself. If the projects suggested in this note are carried out, it will, I believe, be found that a large proportion of the land concerned will automatically be under the management of the Forest Department, and I consider that the erosion control part of it will automatically become to a large extent merely one of the objects of management of this greatly expanded forest area in exactly the same way as it is the first object of management of any area under the Forest Department today. I therefore consider that the whole of this work should be primarily under the Forest Department, though naturally they would consult, and possibly even employ, certain agricultural officers and irrigation officers both of which departments are greatly interested in and concerned with this same problem. In Chapter VII the question of the creation of a Federal Forest Service was discussed and, if such a service were formed, I consider that the whole of this flood, erosion, and desiccation control, in so far as it was controlled at all from the centre, would form an important and definite part of the work of such a Federal Forest Service. In fact, I would go so far as to say that if such a Federal Forest Service were in existence, its men could very well be sent to provinces to review the flood, erosion and desiccation problems and write up a report on the conditions, handing it over

to the provinces for whatever action the provinces deemed fit. This might possibly overcome the difficulty felt by forest officers in some provinces that unless an entirely separate soil conservation department is created the proper examination of erosion, flood and desiccation questions will become merely a side-issue of their own work and will tend to be neglected, just as sometimes the very important branch of forest management, namely working plans, tends to be neglected till there is some special organization to deal with it.

136. The flood and erosion problem hardly exists inside the actual reserved forests under the Forest Department, though often the area of such forests is too small to control the problem sufficiently for the whole province. In the Deccan Ghats the problem is not controlled even in the reserves because they are so scattered and broken. Except in the Central Provinces, Sind and Coorg, there are very serious flood and erosion problems outside the reserved forests under the Forest Department. The allocation of land necessary to control this problem mentioned in para. 116 above will probably show that much of it falls under the ordinary management of the proposed expanded Forest Department Certain provinces are already taking steps about this. Thus, there is the Soil Conservation circle in the Punjab, an Erosion range proposed in the North-West Frontier Province, an anti-erosion officer is proposed in Orissa, Madras is considering the question of control of private forests, where apparently much of the trouble occurs, and Bengal has made recommendations in the report of the West Bengal Forest Committee of 1939.

Chapter V: Forest Research

137. The proposals have already been made in Chapter V of Part I and need only be repeated briefly here for completion.
They are:

(i) Separate the Inspector General of Forests from the President, Forest Research Institute. The Inspector General would then work at the headquarters of Government like all other heads of departments. The Inspector General of Forests should also be made more use of by the Political Department for advice on all the forest problems of Indian States. If a Federal Forest Service were created, these officers would also be available for this purpose.

(ii) The appointment of a commission as soon after the war as possible to enquire into the best organization for the Forest Research Institute.

(iii) Either the complete separation of the Utilization branch together with the Chemistry and Minor Forest Products branch as a separate Institute or, in my opinion better, the division of the present Utilization branch into two branches, each with a technical expert at its head, and the centralization of its office and budget with the rest of the Forest Research Institute under the direct administrative control of the President. Suggested grouping of the Utilization branch might be one branch consisting of Mechanical Engineering, Wood Workshops, Wood Technology and Timber Testing, and the other consisting of Wood Preservation, Wood Seasoning and Paper Pulp. There must also be in the Institute one officer capable of dealing with structural designs in timber and one to deal with problems connected with sawmills, transport, logging, etc. He might possibly be the head of the branch mentioned above consisting of the Mechanical Engineering, Wood Workshops, Wood Technology and Timber Testing sections.

Chapter VI: Forest education

138. Again, this is merely repetition of what has already been given in Part I, Chapter VI: Forest education. The training of Foresters should remain with the provinces as at present.

139. The training of Rangers should be centralized at Dehra Dun as at present, but the class should be moved from Dehra Dun itself out to the New Forest. There is sufficient accommodation in the main building for lecture rooms, laboratories, etc., but it would necessitate the building of hostels for about 80 students with a further two Class II officers' bungalows and two Class I officers' bungalows. The cost could very easily be covered by the value of

the present site and buildings in Dehra Dun. I would advise not giving up these present buildings for a few years owing to the possibilities of an increased Ranger class being necessary for a few years immediately after the war to train the additional subordinate forest staff which will be necessary if the expanded proposals given in paras. 128-129 above come into force.

140. The training of the gazetted officers class is also satisfactory, but it is proposed that the existing legislation for continental tours for forest officers be extended sufficiently to allow a selected number of gazetted officers, or preferably all gazetted officers, to proceed to Europe some time during the first five years of their service.

Chapter VII: Creation of a Federal Forest Service

141. This is a matter which should be discussed. If created, there would certainly be work for it at the Dehra Dun Forest Research Institute which at present is dependent on the goodwill of the provinces for all its forest-trained research officers, to staff the Andamans and other areas under the central Government, as advisers and seconded officers to Indian States or Agencies, and as the central Soil Conservation Department. I may add that there are precedents for such federal services separate from provinces in Australia, Canada, the United States of America, etc.

Chapter VIII: Minor forest products

142. There is little to recommend here except to stress the importance of research and the development of these very valuable and important products. The expanded staff of the Forest Research Institute will continue to compile the information it possesses and fill in the blanks in its knowledge. For the second type of quick-return minor forest product, special research is needed on methods of growth, cultivation, etc. It is recommended that in addition to the staff at the Forest Research Institute, provinces themselves investigate and record all the industries connected with minor forest products in their own provinces. This should be made a definite problem for their research officer or utilization officer whichever they may happen to possess. I may mention that Burma has sent one of its officers to work at the Forest Research Institute to take up this question as soon as Burma is reconquered.